TRIBUTARY CONTAMINANT INPUTS
ON THE
ST. CLAIR AND DETROIT RIVERS
AND
LAKE ST. CLAIR
1984 - 1985

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TRIBUTARY CONTAMINANT INPUTS TO THE ST. CLAIR AND DETROIT RIVERS AND LAKE ST. CLAIR
1984 - 1985

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FEBRUARY 1991

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FOREWORD

To better define the sources and significance of contaminants entering the Upper Great Lakes connecting channels, the relative contribution of Ontario tributaries which discharge to the St. Clair and Detroit Rivers and Lake St. Clair was assessed by the Ontario Ministry of the Environment (MOE), Great Lakes Section, during 1984 and 1985.

This study was conducted to fulfill a Ministry of the Environment commitment to the binational Upper Great Lakes Connecting Channels Study (UGLCCS), whereby non-point source impacts on the St. Clair and Detroit Rivers and Lake St. Clair in the vicinity of tributary mouths would be documented. More specifically, its purpose was to evaluate water quality and sediment data from tributary mouths, in order to identify potential industrial inputs and landfill or agricultural (pesticide or nutrient) impacts from rural, non-point sources on these connecting channels.

Results from this study were previously provided to the scientific study teams of the UGLCCS project for use in the preparation of the final report (UGLCCS, 1989). Findings were also presented at the 31st Conference on Great Lakes Research (IAGLR) in May 1988 at Hamilton, Ontario.

More detailed discussions of study design and results are presented here, with specific recommendations for control programs based on the identification of potential sources. In this regard, additional sampling was conducted by MOE, Southwestern Region during 1986 in Turkey Creek and the Grand Marais Drain to determine the extent of PCB contamination and to track down any sources. During 1989, a joint MOE, Great Lakes Section - Southwestern Region study was conducted in Talfourd Creek to identify the source(s) of the hexachlorobenzene and other industrial organics detected during the 1984-85 tributary study.

Findings of this report will be incorporated into the Stage 1 Remedial Action Plans for the St. Clair and Detroit Rivers.

ACKNOWLEDGEMENTS

The authors wish to gratefully acknowledge the field staff of the Great Lakes Section including E. Law, O. Moore and G. Hobson for collection of samples during 1984 and 1985; and staff of the Laboratory Services Branch for analysis of these samples.

Thanks are extended to Y.S. Hamdy for providing initial direction and comments in project development and implementation.

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1.0 SUMMARY OF FINDINGS

Thirteen tributaries which discharge to the St. Clair and Detroit Rivers and Lake St. Clair from Ontario watersheds were sampled over an 18-month period beginning in April 1984 (Figures 1-4). Water, suspended solids and bottom sediments were collected on an approximately quarterly basis for a wide range of environmental contaminants. These included: nutrients, phenols, inorganics including heavy metals, total PCBs, chlorinated organic compounds, several classes of pesticides, as well as oils and greases. While each of these compounds is discussed in the body of the report, a brief summary of findings for the general categories of contaminants is provided here. These categories are: Pesticides, Industrial Organic Compounds and Inorganics.

1.1 Pesticides:

Land use in the tributary watersheds evaluated during this study is largely agricultural, with 70-75% of the land being devoted to intensively managed agricultural use (Wall *et al*., 1987). As a result, pesticides were detected due to the proximity of sampling with the time of pesticide application. Physical and chemical properties of the pesticides determine their respective partitioning within the surrounding environment. As well, characteristics such as persistence and stability determine the potential for transformation of a particular compound.

Atrazine, a widely used corn herbicide, alpha-BHC, an impurity of the insecticide lindane and p,p'-DDE, a breakdown product of the insecticide DDT were routinely detected. Atrazine occurred largely in the dissolved phase in tributaries to the St. Clair River and Lake St. Clair. The other two pesticides were mainly associated with suspended solids or bottom sediments from Lake St. Clair and Detroit River tributaries. This reflects current use patterns, as well as the low water solubility and persistent nature of some pesticide compounds.

The occurrence of dieldrin and DDT, insecticides which were severely restricted in use prior to the 1984-1985 surveys, gives rise to the question whether these are current or historical inputs. Dieldrin has been banned in the U.S.A. since 1974 and its only allowable use in Canada is for termite control. DDT has similarly been banned since 1972; however, legal uses in Canada include rodent and bat control in enclosed spaces (CCREM, 1987). DDT has been banned entirely in the province of Ontario since January of 1989. Both chemicals are available in the U.S.A. through importation and/or formulation.

Several phenoxy-acid herbicides (picloram; silvex; 2,4,-D; 2,4,5-T) were detected on suspended solids even though they are relatively non-persistent. Measurable values were likely due to recent applications in the watersheds and do not appear to be impacting the environment since dissolved concentrations in whole water did not approach existing Provincial Water Quality Objectives for the protection of aquatic life (PWQOs).

Source identification of contaminants from runoff, Water Pollution Control Plants (WPCPs) and inadequate septic systems is a more difficult problem and requires detailed investigations both upstream and downstream of suspected sources.

1.2 **Industrial Organic Compounds**:

Hexachlorobenzene (HCB) and octachlorostyrene (OCS) as well as several other process-related compounds, were most frequently identified in the outlet of the Cole Drain, which receives treated leachate and untreated runoff from a number of industrial landfill sites. The occurrence of HCB and OCS in the Talfourd Creek and the Sydenham River, with no apparent sources, gives rise to concern. PCBs appeared to be ubiquitous on suspended solids; however, intermittent peak values were measured at several tributaries including Talfourd Creek, Thames and Canard Rivers, which contributed to the high instantaneous loadings from them.
Phenols (total reactive) were routinely detected in tributary waters and frequently exceeded the PWQO. The high flows of the Thames and Sydenham Rivers made them the major sources of phenols.

The significance of non-point source inputs relative to point sources was identified as potentially important for some compounds, particularly in the event that point source control is achieved. A comparison of instantaneous loadings of industrial organic compounds from selected tributaries at peak concentrations revealed that these loads occasionally approached industrial point source loadings from the Dow 42-inch sewer.

The patchy or intermittent nature of some of these peak loads indicates the need for more intensive watershed management studies to provide more extensive loadings information and to document the origin of these compounds.

Concentrations of industrial organic compounds such as HCB and OCS were highest in the Cole Drain. While concentrations of these materials from the Thames and Sydenham Rivers was generally lower than other tributaries, instantaneous loadings were much higher due to the higher flow of these two rivers.

A number of landfill sites containing materials ranging from non-hazardous inert wastes to potentially hazardous wastes have been identified as being situated within the study watersheds (GTC, 1986). The extent of leachate migration and leachate characterization remains to be documented in many cases. This is particularly the case at waste sites which have been inactive for some time and the contents of which have not been accurately recorded. Potential leachate/runoff inputs from these landfills may contribute to tributary contaminant levels as non-point source inputs.

1.3 Inorganics:

Metals such as aluminum, cadmium, copper, iron, and to a lesser degree zinc, routinely exceeded their respective objectives for the protection of aquatic life. Specific industries, such as metal-plating and petroleum refining or services such as marinas may be responsible for contributing certain process or service-related contaminants. For example, nickel, chromium and zinc detected at the mouth of the Little River likely reflect upstream metal-plating, while marinas may be responsible for some localized contamination from the fueling of vessels and metal-based hull treatments. In general, instantaneous loadings of inorganics (including heavy metals) were much greater than loadings of most organic compounds.

PWQOs and dredging guidelines were exceeded most frequently for heavy metals in the surficial sediments of Turkey Creek, Talfourd Creek and the Little River.

2.0 INTRODUCTION AND PURPOSE

2.1 Project Initiation

The upper Great Lakes connecting channels or rivers form the links between Lakes Superior, Huron and Erie. The latter two embrace the Lake Huron-Erie corridor consisting of the St. Clair and Detroit Rivers and Lake St. Clair (Figure 1). This area has been the focus of extensive monitoring by provincial, state and federal agencies through a number of initiatives including the Upper Great Lakes Connecting Channels Study or UGLCCS (1985-1989), the provincial Municipal/Industrial Strategy for Abatement (MISA) Pilot Site studies (1986-1989) and Remedial Action Plan (RAP) programs (ongoing since 1986).

Point source monitoring of Ontario industrial and municipal outfalls discharging directly to the upper Great Lakes connecting channels has been documented for the St. Clair River (Ontario Ministry of the Environment (MOE) and Environment Canada (DOE), 1986).

The significance of contaminant inputs entering through non-point sources has been addressed as part of the Upper Great Lakes Connecting Channels Study. This intensive bi-national (Canada/U.S.) project examined a number of non-point sources including: potential leaching from waste disposal sites, agricultural sources and additional diffuse non-point sources through 15 distinct activities (Appendix I).

The present study was conducted to fulfill an Ontario Ministry of the Environment commitment to the UGLCCS, whereby non-point source impacts on the St. Clair and Detroit Rivers and Lake St. Clair in the vicinity of tributary mouths would be documented. The study was designed to evaluate water quality and sediment data from tributary mouth sampling to identify potential industrial inputs or agricultural (pesticide or nutrient) impacts from rural, non-point sources on the upper connecting channels.

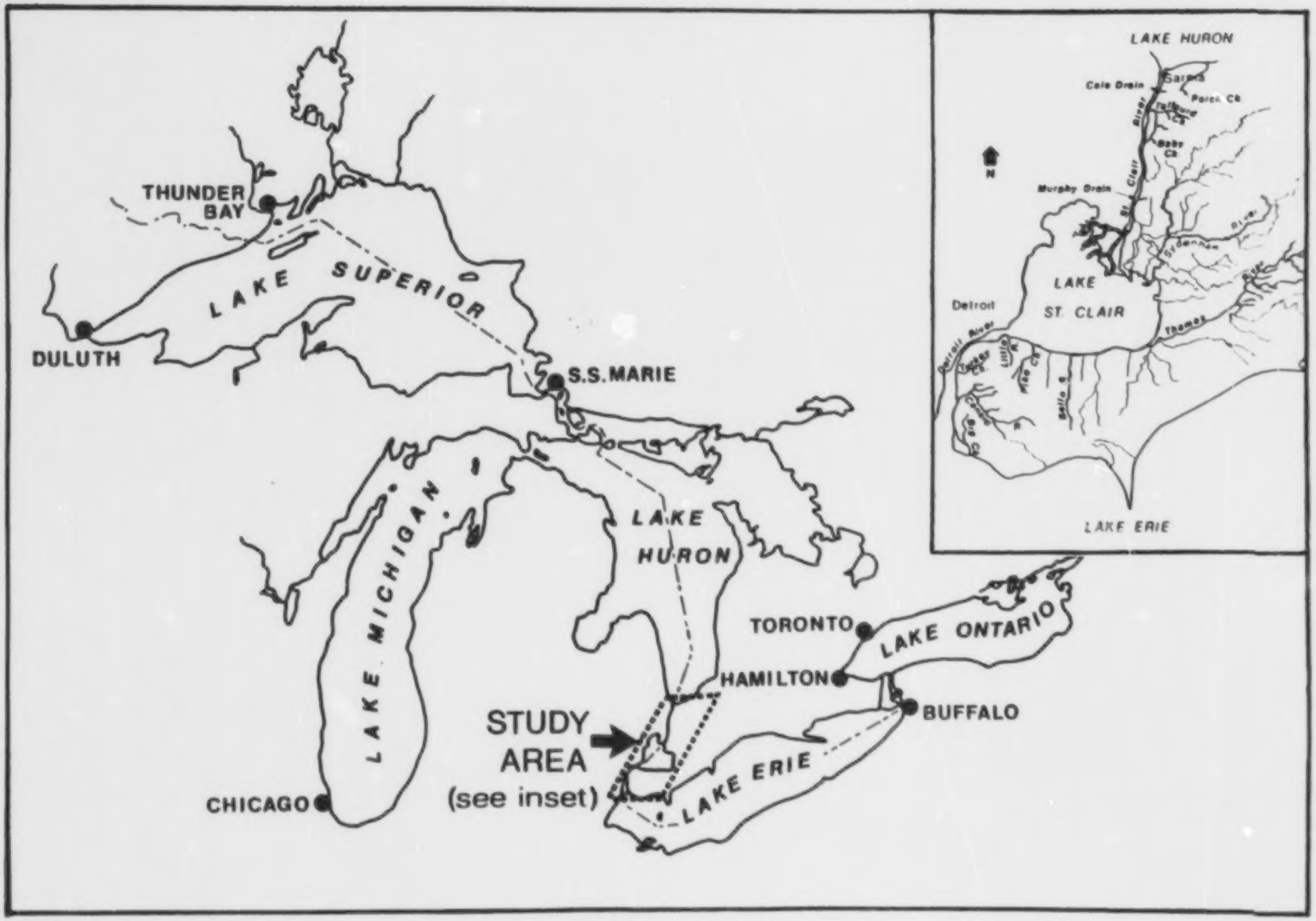

THUNDER BAY
DULUTH
LAKE SUPERIOR
S.S.MARIE
LAKE MICHIGAN
LAKE HURON
CHICAGO
TORONTO
HAMILTON
LAKE ONTARIO
BUFFALO
LAKE ERIE
STUDY AREA (see inset)
LAKE HURON
Sarnia
Cole Drain
Perch Ck
Talfourd Ck
Baby Ck
St. Clair River
N
Murphy Drain
Sydenham River
LAKE ST. CLAIR
Detroit
Detroit River
Thames River
Turkey Ck
Little R
Pike Ck
Belle R
Canard R
Big Ck
LAKE ERIE

FIGURE 1: Study Area: 1984-1985 Ministry of the Environment connecting channels Tributary Study

Estimated loadings from these tributaries will provide insight into the significance of non-point source inputs when compared to point source or "system" loadings to the connecting channels.

2.2 Description of Study Area

Contaminants inputs to the St. Clair and Detroit Rivers and Lake St. Clair include a number of direct discharges from industrial and municipal point sources.

A tributary study of this nature is conducted in order to assess the importance of indirect dischargers (which discharge to tributaries) relative to direct dischargers to the St. Clair and Detroit Rivers and Lake St. Clair. By evaluating water, suspended solids and bottom sediment quality at the mouths of tributaries, one can gain insight into the net impact of any and all indirect dischargers.

During the period from April 1984 to November 1985, staff from the Water Resources Branch, Great Lakes Section, sampled 13 Ontario tributaries in the Lake Huron-Erie corridor. These were selected on the basis of known or suspected inputs (sources) to each tributary and on the potential for impact to the connecting channels. Figures 2-4 identify tributaries and sampling locations for each of the St. Clair and Detroit Rivers and Lake St. Clair, as well as industrial and municipal sources discharging either directly or indirectly (via tributaries) to these water bodies.

Some of the sources to the tributaries are apparent and may have been previously documented through end-of-pipe measurements at specific industrial or municipal point sources as part of UGLCCS, MISA or other investigations.

Other potentially significant sources may be extremely difficult to locate and quantify. These sources may include: urban and rural runoff; surface and groundwater leachate migration from landfill sites; as well as diffuse and intermittent sources from pesticide applications, recreational motorboats, snowmelt and other sources.

The following sections outline in some detail, the presence of known and/or potential sources to these tributaries. Recognizing that direct cause/effect relationships from upstream sources based on a tributary mouth study may only be inferred, the following will provide possible explanations for the occurrence of some contaminants. Further, this will flag unexpected materials and provide a basis for future investigations.

2.2.1 St. Clair River

Perch Creek:

Perch Creek (Figure 2) discharges to lower Lake Huron through the Gull Drain; however, the hydrodynamics of this area results in the plume hugging the shoreline and entering the St. Clair River. There are no apparent point source discharges entering Perch Creek; however, a number of fish kills have been observed in the past. Tricil operates a hazardous waste treatment and disposal facility near the headwaters of Perch Creek, Baby Creek and Bear Creek (see Sydenham River, section 2.2.2) but there is no evidence of leachate migration (GTC, 1986).

The Township of Sarnia operates a domestic commercial landfill site with potential for surface runoff to Perch Creek (GTC, 1986). A leachate collection system has been operating since 1986 and pilot scale leachate treatment systems are being considered for use in the future (D. Gaudenzi, MOE, Sarnia District Office, personal communication 1988).

Cole Drain

Treated leachate and untreated runoff from Dow, Polysar and Esso Petroleum landfill sites adjacent to the Scott Road ditch eventually reach the St. Clair River through the Cole Drain (Figure 2). Hazardous and non-hazardous solid and liquid waste has been disposed of at the Dow Scott Road Landfill Site since 1948 (GTC, 1986). This drain has been demonstrated to be a very significant source to the St. Clair River of many of the materials attributed to Dow Chemical Ltd. (MOE, 1987; 1989).

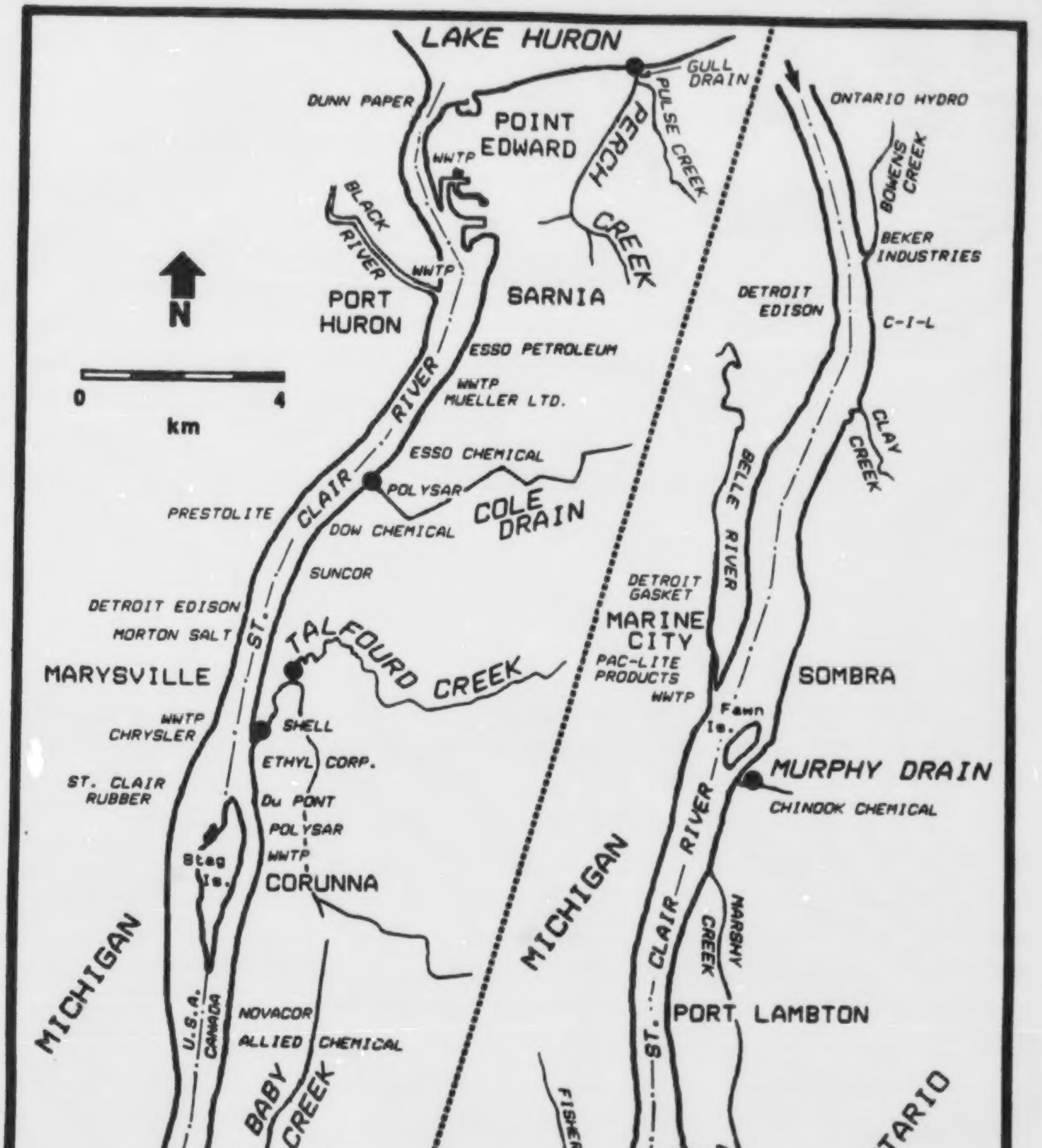

LAKE HURON
GULL DRAIN
DUNN PAPER
ONTARIO HYDRO
POINT EDWARD
PERCH CREEK
PULSE CREEK
WWTP
BLACK RIVER
BOWENS CREEK
BEKER INDUSTRIES
N
PORT HURON
SARNIA
DETROIT EDISON
C-I-L
ESSO PETROLEUM
WWTP
MUELLER LTD.
0
4
km
CLAY CREEK
ESSO CHEMICAL
POLYSAR
COLE DRAIN
PRESTOLITE
DOW CHEMICAL
BELLE RIVER
SUNCOR
DETROIT GASKET
DETROIT EDISON
MARINE CITY
MORTON SALT
TALFOURD CREEK
MARYSVILLE
PAC-LITE PRODUCTS
SOMBRA
WWTP
WWTP
CHRYSLER
SHELL
Fawn Is.
ETHYL CORP.
MURPHY DRAIN
ST. CLAIR RUBBER
CHINOOK CHEMICAL
Du PONT
POLYSAR
WWTP
Stag Is.
CORUNNA
ST. CLAIR RIVER
MICHIGAN
MARSHY CREEK
MICHIGAN
U.S.A.
CANADA
NOVACOR
PORT LAMBTON
ALLIED CHEMICAL
BABY CREEK
ONTARIO
FISHER CREEK
MOORETOWN
CHENAL ECARTÉ
ST. CLAIR
ALGONAC
COURTRIGHT
WWTP
PINE RIVER
Walpole Island
DIAMOND CRYSTAL SALT
ONTARIO
LAKE ST. CLAIR

FIGURE 2: *St. Clair River 1984-1985 Tributary Study sampling locations.*

The Cole Drain discharge averages about 145,000 m^3/day (Edwardson and King, 1988) to the St. Clair River. It receives drainage from the Township, Polysar perimeter and Scott Road ditches. Drainage enters these ditches as runoff from undeveloped and developed land, waste disposal and product storage areas, treated and untreated runoff and industrial effluent and cooling water (MOE/DOE, 1986).

Condensate, storm and cooling water from Polysar and effluent from the Polysar Biological Oxidation (Biox) treatment plant enter the Cole Drain immediately prior to its discharge to the St. Clair River (Edwardson and King, 1988). The Biox plant is responsible for treating waste material from Polysar and other area industries by means of microbiological breakdown.

Talfourd Creek

Shell Canada Limited operates a crude oil refinery and a chemical plant situated north of Corunna. Once-through cooling water and discharges from the refinery stormwater and oily water separators are directed to Talfourd Creek (Edwardson and King, 1988) (Figure 2).

Runoff and/or sub-surface water was identified as potentially entering Talfourd Creek from several landfill sites (GTC, 1986). These include, though perhaps are not limited to: Dow Chemical Ltd., Unitec Inc. and Weiland Chemical Ltd. Surface runoff controls appear to be adequate for these sites; however, leachate migration requires further documentation. Studies conducted in the vicinity of the Unitec site indicate no change in water quality downstream compared to upstream (MOE/DOE, 1988). Each of these sites contains industrial wastes, some of which may be considered hazardous, while much of the material is non-hazardous or inert.

Baby Creek

Novacor at Corunna, a producer of polyethylene, discharges its cooling water and sanitary wastewater to the St. Clair River following on-site treatment. Stormwater is normally routed to the St. Clair River; however, under high runoff conditions, some stormwater may overflow retention ponds and enter Baby Creek (Figure 2).

Potentially contaminated stormwater may also be discharged from the Shell Canada Ltd. chemical plant to Baby Creek by way of a retention pond.

Murphy Drain

Chinook chemicals manufacturers ammonia-based agricultural products. Wastewater is discharged to the St. Clair River via the Murphy Drain (Figure 2).

2.2.2 Lake St. Clair

Sydenham and Thames Rivers

Both rivers pass through intensively managed agricultural areas comprising 75% of the respective drainage basins (Figure 3). Cash cropping accounts for the greatest land use, with approximately 70% of agricultural land dedicated to corn and soybeans (Wall *et al*., 1987).

In the Thames and Sydenham basins, approximately 2.4 kg of pesticides are applied to each hectare of agricultural land. Up to 20% of the Lake St. Clair drainage basin has been demonstrated to have a high potential for pesticide transport to surface and groundwater systems (Wall, *et al*. 1987).

The Thames River also passes through urban communities such as Woodstock London, Thamesville and Chatham. The Sydenham River passes through such communities as Wallaceburg, Dresden, Alvinston and Strathroy. Both rivers receive urban and rural drainage as well as industrial and municipal point source discharges. Several landfills are also situated within the Thames and Sydenham drainage basins (GTC, 1986), and a marina is located at the mouth of the Thames River. Bear Creek, which is tributary to the Sydenham River, receives potential drainage from landfill sites as well as from oil wells near Petrolia, Ontario.

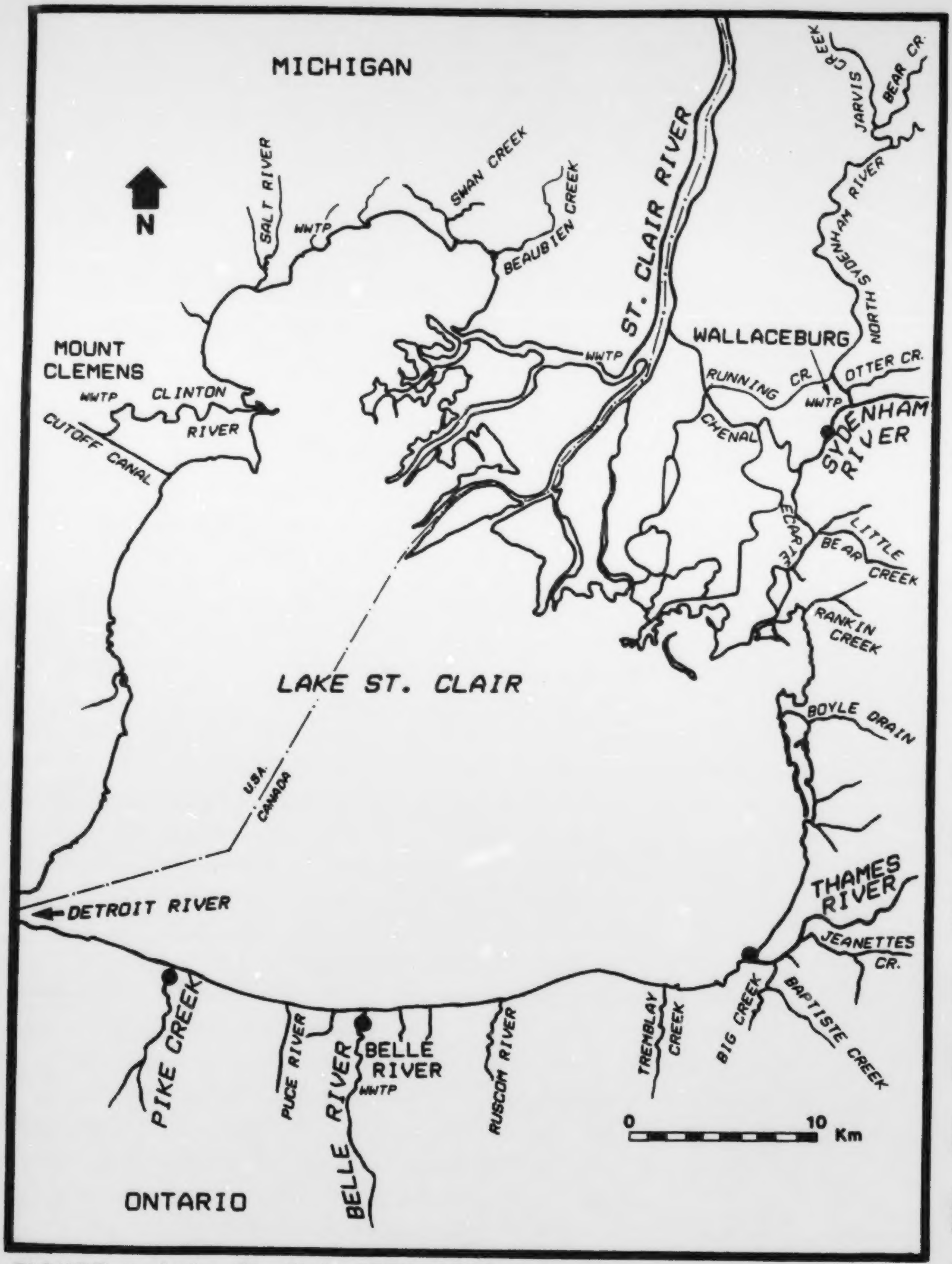

MICHIGAN
N
SALT RIVER
WWTP
SWAN CREEK
BEAUBIEN CREEK
ST. CLAIR RIVER
JARVIS CREEK
BEAR CR.
NORTH SYDENHAM RIVER
WALLACEBURG
MOUNT CLEMENS
WWTP
CLINTON RIVER
CUTOFF CANAL
WWTP
RUNNING CR.
OTTER CR.
WWTP
CHENAL
SYDENHAM RIVER
ECARTE
LITTLE BEAR CREEK
RANKIN CREEK
LAKE ST. CLAIR
BOYLE DRAIN
U.S.A.
CANADA
THAMES RIVER
DETROIT RIVER
JEANETTES CR.
BAPTISTE CREEK
BIG CREEK
TREMBLAY CREEK
RUSCOM RIVER
BELLE RIVER
BELLE RIVER WWTP
PUCE RIVER
PIKE CREEK
ONTARIO
0
10
Km

FIGURE 3: Lake St. Clair 1984-1985 Tributary Study sampling locations

Belle River and Pike Creek

Both of these tributaries are situated on a primarily agricultural drainage basin, not unlike the Sydenham and Thames Rivers, and enter Lake St. Clair along its southern shore (Figure 3). A marina is situated at the mouth of the Belle River, serving the community of Belle River (population 3,800).

Municipal wastes are discharged directly to Lake St. Clair from the Belle River waste water treatment plant (WWTP). The area around Pike Creek is undergoing rapid residential and commercial expansion; however, there are no direct discharges to the Creek. Hiram Walker (a distillery) operates a large storage facility adjacent to Pike Creek. No wastes are generated since no processing occurs at the site.

2.2.3 Detroit River

Little River

Historically, the Little River (Figure 4) has experienced elevated bacteriological counts due to inadequate treatment at the Little River WWTP (Kinkead and Hamdy, 1976; Hamdy and Johnson, 1987).

The WWTP is undergoing expansion to improve its hydraulic capacity and the City of Windsor is currently evaluating options to further improve water quality in the Little River. It should be noted that the Little River WWTP treats mainly domestic sewage, while most industrial wastes from the Windsor area are directed to the West Windsor WWTP.

Industrial wastes from Wickes Manufacturing (Windsor Bumper), an electroplating industry which discharges directly to the Little River, contain elevated levels of heavy metals (e.g., nickel, chromium and zinc); however, the industry does not appear to be a source of organic contaminants (Edwardson and King, 1988). Improvements to the waste treatment facilities at Windsor Bumper are planned to conform with the Ministry's Sewer-Use Control by-law. This will enable the plant to discharge its effluent to the Little River WWTP for treatment.

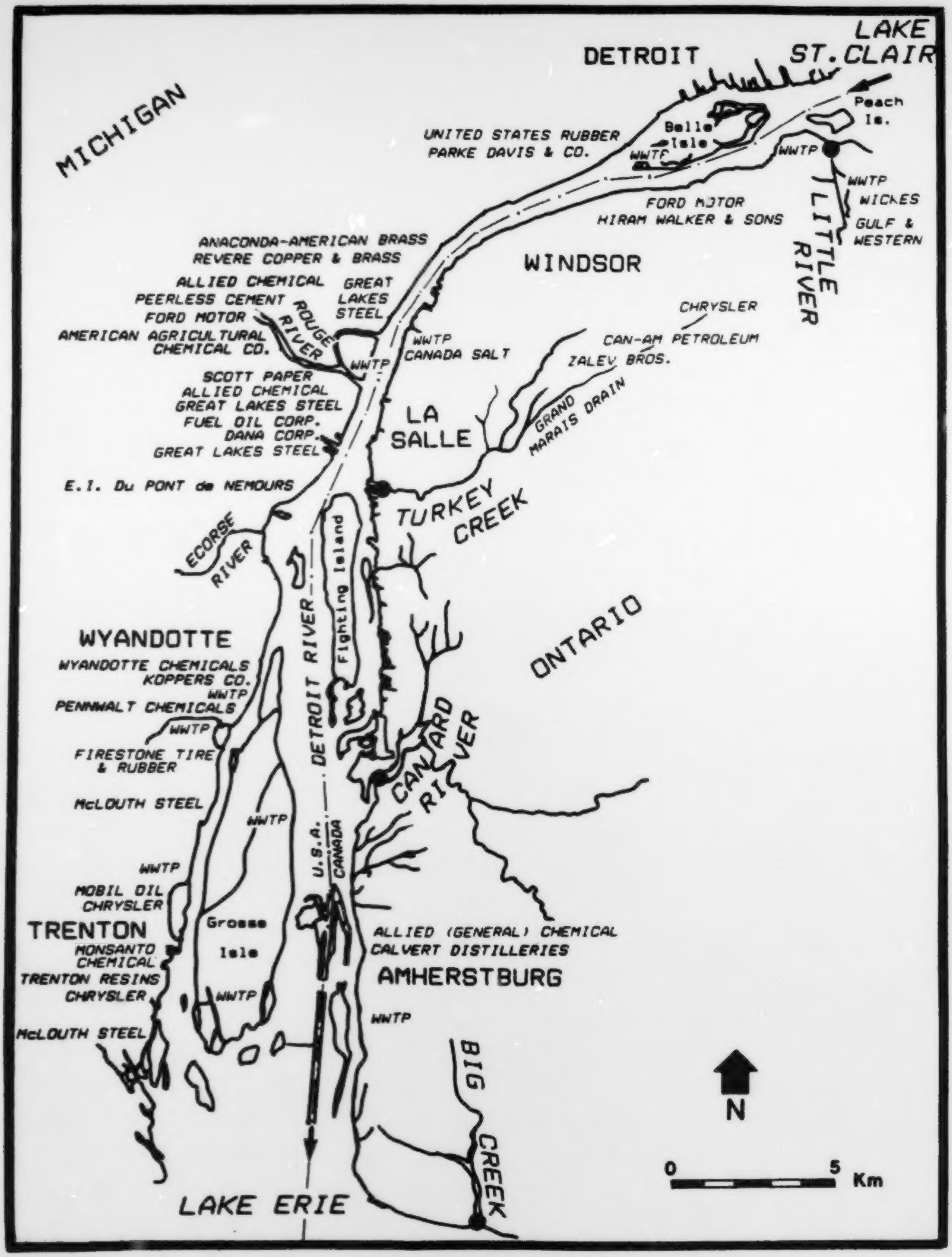

LAKE ST. CLAIR
DETROIT
MICHIGAN
Peach Is.
Belle Isle
WWTP
UNITED STATES RUBBER
PARKE DAVIS & CO.
WWTP
WWTP
WICKES
GULF & WESTERN
FORD MOTOR
HIRAM WALKER & SONS
LITTLE RIVER
ANACONDA-AMERICAN BRASS
REVERE COPPER & BRASS
WINDSOR
ALLIED CHEMICAL
PEERLESS CEMENT
FORD MOTOR
AMERICAN AGRICULTURAL CHEMICAL CO.
GREAT LAKES STEEL
ROUGE RIVER
CHRYSLER
CAN-AM PETROLEUM
ZALEV BROS.
WWTP
CANADA SALT
WWTP
SCOTT PAPER
ALLIED CHEMICAL
GREAT LAKES STEEL
FUEL OIL CORP.
DANA CORP.
GREAT LAKES STEEL
LA SALLE
GRAND MARAIS DRAIN
E.I. Du PONT de NEMOURS
TURKEY CREEK
ECORSE RIVER
Fighting Island
DETROIT RIVER
ONTARIO
WYANDOTTE
WYANDOTTE CHEMICALS
KOPPERS CO.
WWTP
PENNWALT CHEMICALS
WWTP
FIRESTONE TIRE & RUBBER
CANARD RIVER
McLOUTH STEEL
WWTP
U.S.A.
CANADA
WWTP
MOBIL OIL
CHRYSLER
TRENTON
Grosse Isle
ALLIED (GENERAL) CHEMICAL
CALVERT DISTILLERIES
MONSANTO CHEMICAL
TRENTON RESINS
CHRYSLER
AMHERSTBURG
WWTP
WWTP
McLOUTH STEEL
BIG CREEK
N
0
5
Km
LAKE ERIE

FIGURE 4: Detroit River 1984-1985 Tributary Study sampling locations

Domestic and industrial solid wastes from Chrysler, Ford, General Motors and Hiram Walker were disposed of at a City of Windsor disposal site prior to 1973. Shallow groundwater in this vicinity travels northward to Lake St. Clair by way of the Little River drainage basin. Leachate from this site has been identified by MOE; however, it has not been characterized. Further investigations will be required to document the potential impact on water quality in the Little River (GTC, 1986). This work should include a watershed study to document the occurrence and impact of specific sources.

Gulf and Western Canada Ltd., which is adjacent to the Little River, currently operates a landfill containing process sludges and neutralized "plating" solutions. Surface runoff is being monitored; however, no ground water monitoring equipment has been installed (GTC, 1986).

Turkey Creek

A series of drains and ditches lead to Turkey Creek south of Windsor (Figure 4). Sediments in the Grand Marais Drain and ditches near Zalev Brothers scrapyard contained elevated PCB levels in 1986. Water and sediment samples taken in 1987 from the Grand Marais Drain and Turkey Creek revealed very low PCB levels. Further samples will be obtained to determine if these lowered levels indicate a trend or are spurious (M. Paraschak, MOE, Windsor District Office personal communication, 1988). Can-Am Petroleum, a waste oil recycler is also currently operating in the watershed.

The Grand Marais Drain is subject to discharges from storm sewers, septic tanks, and various small industrial operations. This area of Windsor is not entirely serviced by sanitary sewers and is currently undergoing a $40 million construction project to replace inadequate septic systems with sanitary sewers (Hamdy and Johnson, 1987).

During and prior to this investigation, the Chrysler Canada automotive facility discharged effluent from their oily waste treatment plant directly to Turkey Creek. This practice has stopped in the last several years; however, residual contamination may still be present.

Canard River (Rivière aux Canards)

Industrial operations in the Canard River (Figure 4) are limited to the manufacture of soda ash by General Chemical. This may result in chloride levels above background due to the use of brine in the manufacturing process.

The watershed is primarily agricultural with little industrial or municipal impacts. A waste site inventory (GTC, 1986) of the area did not highlight any landfills with potential runoff to the Canard River.

Big Creek

Big Creek drains a predominantly rural marshy area southeast of Amherstburg (Figure 4). Occasional oil wells and a rock quarry may result in some inorganic salts being elevated, while agricultural practices may increase pesticide contamination.

A waste site operated by General Chemical prior to 1982 was demonstrated to impact the Big Creek marsh and local domestic wells (GTC, 1986). A new settling basin has been in use since 1982 with no anticipated discharge to Big Creek.

3.0 METHODS

3.1 Field and Laboratory Methods

A series of eight surveys on Ontario tributaries to the St. Clair and Detroit Rivers and Lake St. Clair were conducted between April, 1984 and November, 1985. During each survey, water and suspended solids samples were obtained from thirteen (13) tributary mouths (Table 1). An additional station was located upstream of Shell Oil, which discharges immediately upstream of the mouth of Talfourd Creek.

During each survey, tributary discharge rates were directly measured by cross-sectional profiling of tributary depth and velocity using a Marsh-McBirney meter. These data were later converted to total discharge rates expressed in cubic metres/second (m^3/s). Temperature, dissolved oxygen and pH profiles were recorded at mid-channel of each tributary mouth prior to sampling to determine if intrusion from the respective connecting channel was occurring. If this was the case, the sampling station was moved upstream to a more appropriate location.

Tributary water was obtained from mid-depth using a March Model 5CMD submersible pump and Teflon-lined hose connected to a continuous-flow Alfa-Laval Model 103B centrifuge. Composite whole water samples were collected quarterly over the three to six-hour centrifugation period by collecting subsamples from the influent stream to the centrifuge in the appropriate sample bottles (MOE, 1985). The total volume of water processed during centrifugation ranged from 1500 to 2000 litres, enabling a minimum of 25 grams wet weight of suspended solids to be collected.

Water samples were analysed for suspended solids, nutrients, total reactive phenols (4-AAP), inorganics including heavy metals, total PCBs, insecticides, herbicides, chlorinated aromatics, chlorinated phenols and conventional water quality parameters (Table 2). A further water sample was submitted from each location for priority pollutants analysis on the first survey only.

TABLE 1: MOE ST. CLAIR/DETROIT RIVERS TRIBUTARY SAMPLING LOCATIONS: 1984 - 1985

Station #	Location	Refer to Figure#	Receiving Body of Water
0800150006	Perch Creek/Gull Drain	2	Lake Huron
1500150007	Cole Drain	2	St. Clair River
1500150004	Talfourd Creek (upstream)	2	St. Clair River
1500150003	Talfourd Creek (mouth)	2	St. Clair River
1500150005	Baby Creek	2	St. Clair River
1500150006	Murphy Drain	2	St. Clair River
0400150002	Sydenham River	3	Lake St. Clair
0400150001	Thames River	3	Lake St. Clair
0400150003	Belle River	3	Lake St. Clair
0400150004	Pike Creek	3	Lake St. Clair
1000150005	Little River	4	Detroit River
1000150006	Turkey Creek	4	Detroit River
1000150007	Canard River	4	Detroit River
1000150008	Big Creek	4	Lake Erie

Suspended solids and bottom sediments were analysed for total PCBs, insecticides, herbicides, chlorinated phenols, chlorinated aromatics, inorganics including heavy metals, nutrients, solvent extractables, loss on ignition and particle size distribution (Table 2). Contaminant concentrations are expressed on a dry weight basis for sediments.

Surficial bottom sediments were collected by Ponar grab during the final survey in each calendar year and analysed for the above parameters. The top 3 cm of each of three grabs taken across the tributary mouth were composited and homogenized prior to submission for analysis.

Duplicate (split) water and suspended solid samples and field blanks for water samples only were taken at the Thames River and Talfourd Creek mouths on each survey. Duplicate results are presented together with sample results in Appendix II. Typically, there is excellent agreement between duplicates, as values were within ± 10% of each other in most instances. Differences between duplicates rarely exceeded 20%. Results from distilled water field blanks were generally below laboratory method detection limits.

Field and laboratory procedures followed established Ministry of the Environment sampling and analytical protocols (MOE, 1983 and 1985).

3.2 Statistical Treatment and Use of Data

Much of the data presented in this report has been interpreted in a descriptive or qualitative manner. Due to the time-consuming nature of the sample collection program and the resultant few samples, the use of statistical tools was limited, as was the confidence associated with long-term (i.e., yearly) estimates of loadings. As a result, figures presented for various parameters reflect arithmetic means for all surveys on a station-by-station basis. Loadings are expressed as instantaneous values reflecting the concern over extrapolating the data from a relatively limited data set to generate long-term averages.

As noted previously, flows used in calculating loadings were measured in the field, coincident with sampling. However, for large rivers

TABLE 2: 1984-1985 - TRIBUTARY STUDY LIST OF ANALYTICAL PARAMETERS BY MEDIA

PARAMETER	MEDIA	
	BOTTOM SEDIMENTS/ SUSPENDED SOLIDS	WATER
Conductivity, suspended solids, dissolved inorganic carbon, dissolved organic carbon, chlorides, alkalinity, hardness		✓
Total phosphorus, total Kjeldahl nitrogen	✓	✓
Ammonia, nitrate + nitrite, total phenols		✓
Aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, zinc	✓	✓
Solvent extractables	✓	
Organochlorine insecticides	✓	✓
Organophosphorus insecticides	*	✓
Carbamate insecticides	*	✓
Phenoxy acid herbicides	✓	✓
Triazine herbicides	✓	✓
Chlorinated aromatics	✓	✓
Chlorinated phenols	✓	✓
Total PCBs	✓	✓
Priority organics	*	✓**

* no analytical capability for sediments.

** 1st survey only

(e.g. Thames R.), data supplied by the Water Survey of Canada and corrected for the river mouth was used. If values were available from both sources, a mean daily discharge was utilized to calculate instantaneous loadings; otherwise, either field-collected or Water Survey of Canada data were used. Loadings could not be calculated for two tributaries, Murphy Drain and Big Creek, because of lack of flow during sampling.

4.0 RESULTS AND DISCUSSION

The following discussion of results is intended to provide the reader with a concise overall summary. Hence, loadings presented are based on arithmetic mean concentrations and flows.

4.1 UGLCCS Target Compounds:

An initial assessment of the tributary monitoring data was conducted using a designated "short list" of contaminants chosen by the Modelling Work Group of the UGLCCS. The list, which was assembled based upon the criteria of ubiquity, level of concern and utility for modelling purposes, consisted of the following compounds:

- Total Cadmium (Cd)
- Total Lead (Pb)
- Hexachlorobenzene (HCB)
- Octachlorostyrene (OCS)
- Total Polychlorinated Biphenyls (PCBs)
- Chloride (Cl^-)
- Total Phosphorus (TP)

While each of these seven contaminants may not satisfy all of the above criteria, their documented presence in the upper Great Lakes connecting channels (Hamdy and Post, 1985; Kauss and Hamdy, 1985; MOE/DOE, 1986; Johnson and Kauss, 1987), along with numerous other contaminants of concern, will enable an estimation of the relative importance of non-point source inputs.

Lead, HCB and OCS are mainly attributed to industrial point sources along the Canadian shore of the St. Clair River (Kauss and Hamdy, 1985; MOE/DOE 1986; Johnson and Kauss, 1987), while lead, cadmium and PCBs are contaminants of concern in the Detroit River (Hamdy and Post, 1985; Kaiser et al.; 1985; Kauss and Hamdy, 1985; Johnson and Kauss, 1987).

Chloride is a conservative parameter which is typically associated with industrial point sources through the refinement of mined salt or as a by-product in chemical manufacture. Elevated chloride levels may also occur as a result of urban runoff containing road salt or from brine displacement in the storage of chemical wastes. It has been demonstrated that chloride provides reasonable sensitivity for near-field modelling applications.

Municipal Water Pollution Control Plants (WPCPs) and urban runoff contribute the greatest phosphorus loadings to tributaries and the connecting channels. Total phosphorus is a useful indicator of enrichment from nutrient loadings. Total phosphorus and chloride have been identified as requiring further point and non-point source control (IJC, 1985).

The above short list of contaminants will serve as a starting point for discussion of results. In addition to this abbreviated list, this study has also analyzed for a number of classes of pesticides, many additional metals and chlorinated organic compounds to determine their significance in both tributaries and the Great Lakes connecting channels. Each contaminant will be discussed with respect to the media in which it occurs and its potential sources, as well as any exceedences of water quality objectives for the protection of aquatic life or of guidelines for dredged material.

By discussing the occurrence and distribution of these and other contaminants from both potential point and non-point sources, the relative importance of each source group will be placed into perspective.

4.2 Industrial/Municipal Point Source Contaminants

Synthetic organic compounds do not occur naturally and may be a useful fingerprint to identify the receiving water impact of industrial outfalls which discharge by-products and/or trace levels of end products to tributaries. In addition to the loss of waste by-products, continuous low level inputs or episodic spills of waste-and end-products occur at various industries throughout the Lake Huron-Erie corridor (MOE/DOE, 1986; MOE, 1987; Edwardson and King, 1988).

4.2.1 Industrial Organic Compounds

A number of organic compounds have been identified in wastewater discharged from Ontario industrial point sources along the St. Clair River (MOE/DOE, 1986; MOE, 1987).

Petrochemical industries such as Dow Chemical at Sarnia, Ontario, produce chlorinated solvents including perchloroethylene (tetrachloroethylene), vinyl chloride and carbon tetrachloride. By-products in the manufacture of perchloroethylene include hexachlorobenzene and hexachloroethane (Wells, 1985). Hexachlorobenzene has been identified as a persistent, highly toxic, bioaccumulative and mutagenic compound (MOE/DOE, 1986). Hexachlorobutadiene and octachlorostyrene occur as impurities in the electrolytic production of chlorine (Kaminsky and Hites, 1984) a process employed at Dow Chemical in Sarnia.

The above by-products and waste materials accumulate as a residual "taffy" (Kaminsky and Hites, 1984) which necessitates disposal, either through landfilling or by incineration. This leads to the possibility of reintroducing these compounds to the local environment.

Since these waste materials are produced at a limited number of sites, it is informative to map their distribution in tributary samples in order to determine if the problem is restricted in areal extent or if additional sources may exist. For example, Kaminsky and Hites (1984) reported that isolated watersheds adjacent to known sources contained no OCS while

TABLE 3: OCCURRENCE OF INDUSTRIAL ORGANIC COMPOUNDS IN WHOLE WATER SAMPLES

TRIBUTARY	HEXACHLOROBENZENE			HEXACHLOROBUTADIENE			HEXACHLOROETHANE			TOTAL PCBs			TOTAL PHENOLS			OCTACHLOROSTYRENE		
	%>MDL	%>PWQO	n	%>MDL	%>PWQO	n	%>MDL	%>PWQO	n	%>MDL	%>PWQO	n	%>MDL	%>PWQO	n	%>MDL	%>PWQO	n
PERCH CREEK	20	20	5	0	0	4	0	-	4	0	NAP	5	75	75	4	0	-	4
COLE DRAIN	88.9	88.9	9	57.1	28.6	7	42.9	-	7	0	NAP	9	100	100	8	28.7	-	7
TALFOURD CREEK (d/s)	78.6	57.1	14	30	0	10	42.9	-	14	0	NAP	14	100	100	12	7.1	-	14
TALFOURD CREEK (u/s)	25	0	8	25	0	8	12.5	-	8	0	NAP	8	71.4	71.4	7	0	-	8
BABY CREEK	0	0	6	33.3	0	6	0	-	6	0	NAP	6	71.4	57.1	7	0	-	6
MURPHY DRAIN	14.3	0	7	50	0	6	16.7	-	6	0	NAP	7	85.7	57.1	7	0	-	6
SYDENHAM RIVER	8.3	0	12	27.3	0	11	8.3	-	12	0	NAP	12	77.8	66.7	9	0	-	12
THAMES RIVER	0	0	14	0	0	14	7.1	-	14	0	NAP	14	69.2	46.1	13	0	-	14
BELLE RIVER	0	0	6	33.3	0	6	0	-	6	0	NAP	6	83.3	66.7	6	0	-	6
PIKE CREEK	0	0	5	20	0	5	0	-	5	0	NAP	5	100	80	5	0	-	5
LITTLE RIVER	28.6	0	7	12.5	0	8	12.5	-	8	0	NAP	8	71.4	71.4	7	0	-	8
TURKEY CREEK	25	0	8	0	0	8	0	-	8	0	NAP	8	100	85.7	7	0	-	8
CANARD RIVER	12.5	0	8	12.5	0	8	12.5	-	8	0	NAP	8	71.4	71.4	7	0	-	8
BIG CREEK	0	0	1	0	0	1	0	-	1	0	NAP	1	0	0	1	0	-	1
PWQO	6.5 ng/L			100 ng/L*			N.A.			1 ng/L			1 µg/L			N.A.		
MDL	1 ng/L			1 ng/L			1 ng/L			20 ng/L			0.2 µg/L			1 ng/L		

MDL - Method Detection Limit
N.A. - Not Available
* - Manitoba guideline
PWQO - Provincial Water Quality Objective
NAP - Not applicable since MDL is >PWQO
n - Number of samples analyzed
d/s - Downstream station (at mouth)
u/s - Upstream station

areas downstream of Dow Chemical in Sarnia (the only Ontario chlorine producer in the lower Great Lakes) contained detectable OCS residues.

Industrial organic contaminants such as hexachloroethane (HCE), hexachlorobenzene (HCB), and hexachlorobutadiene (HCBD) were detected most frequently in whole water samples from the Cole Drain (43%, 89% and 57% of samples, respectively). These compounds were also detected at several other locations, including Talfourd Creek and the Murphy Drain, but generally at a lower frequency (Table 3).

Hexachlorobutadiene and hexachloroethane could not be measured on suspended solids and sediments due to analytical limitations during 1984 and 1985. However, subsamples of bottom sediments collected in November, 1985, were analyzed for these contaminants by an external contract laboratory (Mann Testing, Mississauga, Ontario). Of the seven tributaries selected (Perch Creek, Talfourd Creek d/s, Murphy Drain, Sydenham River, Thames River, Little River and Turkey Creek), it is noteworthy that only the Talfourd Creek sediments contained quantifiable levels of HCBD (12.7 ng/g). HCE was not detected at a method detection limit (MDL) of 5 ng/g (ppb).

HCB was detected in 2 of 8 water samples at the upstream station in Talfourd Creek and 79% (11 of 14) of water samples obtained at the mouth. More than half of these latter samples, as well as those from the Cole Drain, exceeded the Provincial Water Quality Objective for the protection of aquatic life (PWQO) of 6.5 ng/L (ppt).

Findings from current MOE investigations have shown a strong affinity between suspended particulate material and higher chlorinated hydrocarbons such as hexachlorobenzene and octachlorostyrene (MOE, 1989). The occurrence, primarily on solids, of HCB and OCS in Talfourd Creek and OCS in the Sydenham River (Figures 5 and 6) with no apparent source gives rise to some concern. Possible sources may involve airborne transport or entry by way of landfill leachate; however, these mechanisms are not well documented. Studies to address airborne input, urban runoff, landfill leachate and groundwater contamination formed

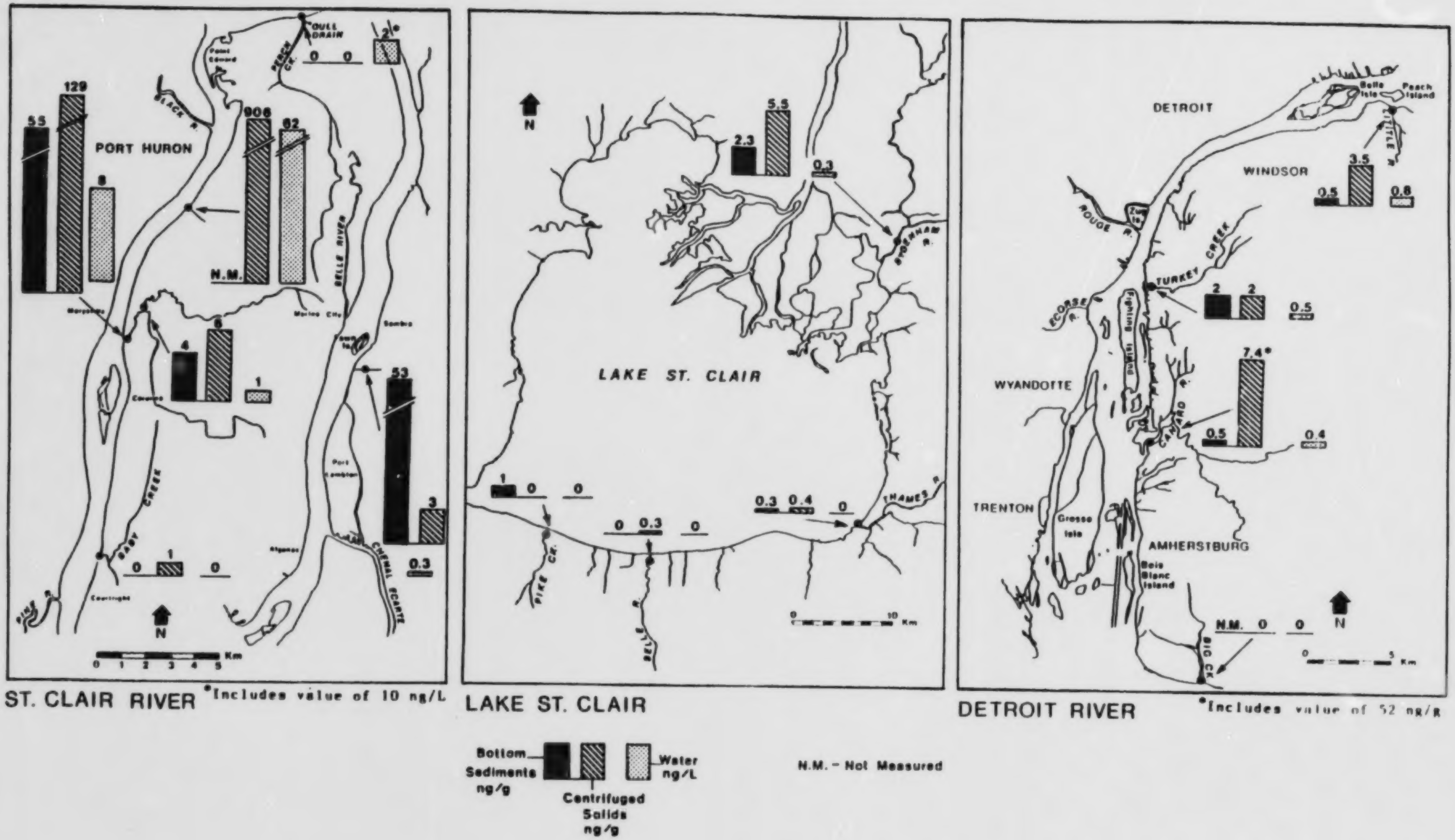
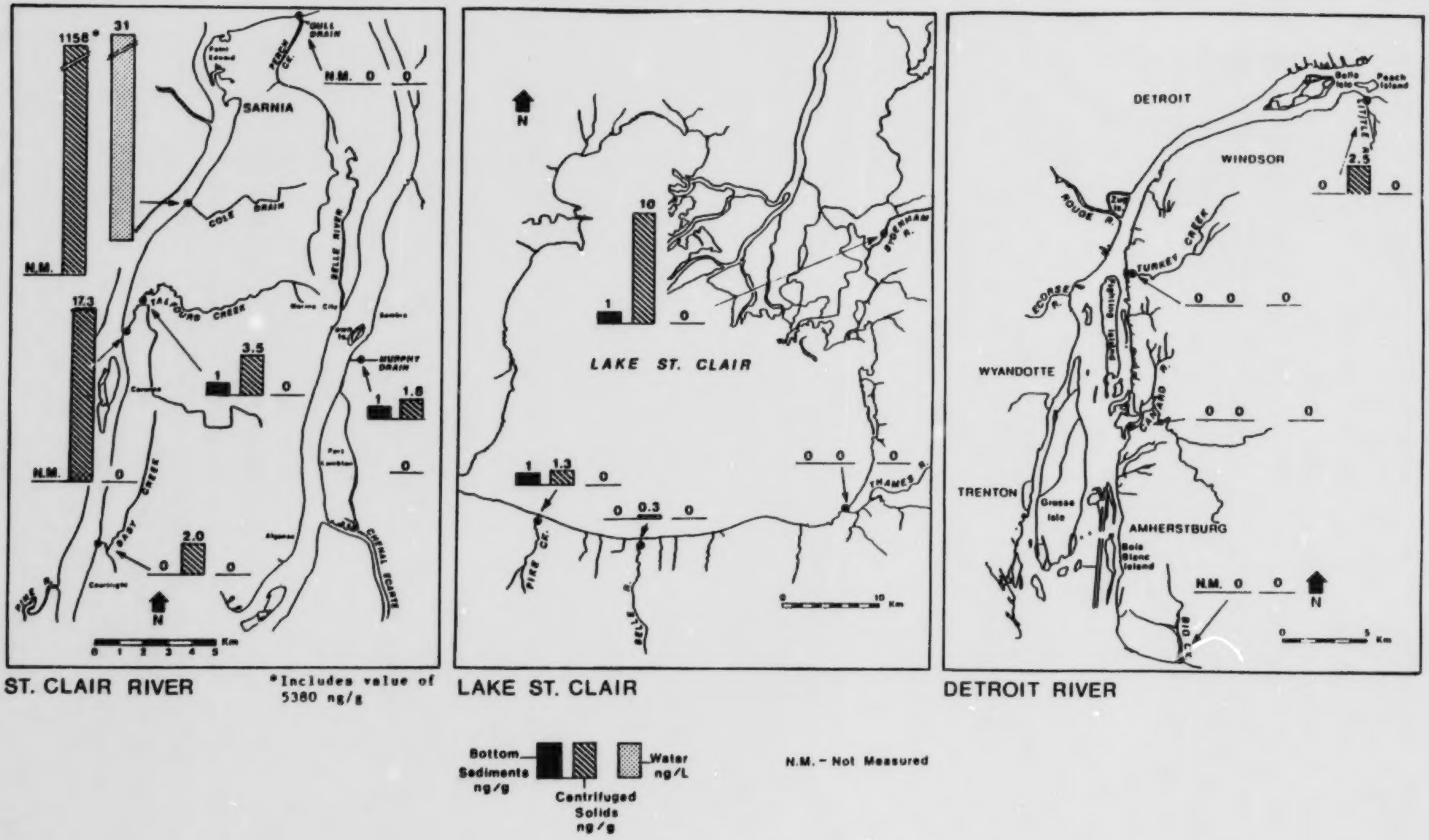

ST. CLAIR RIVER
*Includes value of 10 ng/L
PORT HURON
BLACK R.
Point Edward
PERCH CK.
DULL DRAIN
BELLE RIVER
BABY CREEK
PINE R.
CHENAL ECARTE
Marysville
Marine City
Sombra
Corunna
Port Lambton
Courtright
Algonac
55
129
8
906
82
N.M.
0
0
2*
4
6
1
53
3
0.3
0
1
0
N
0 1 2 3 4 5 Km
LAKE ST. CLAIR
N
2.3
5.5
0.3
SYDENHAM R.
THAMES R.
PIKE CK.
BELLE R.
1
0
0
0
0.3
0
0.3
0.4
0
0 10 Km
DETROIT RIVER
*Includes value of 52 ng/R
DETROIT
WINDSOR
Belle Isle
Peach Island
LITTLE R.
ROUGE R.
Zug Is.
ECORSE R.
TURKEY CREEK
Fighting Island
CANARD R.
WYANDOTTE
TRENTON
Grosse Isle
AMHERSTBURG
Bois Blanc Island
BIG CK.
0.5
3.5
0.8
2
2
0.5
0.5
7.4*
0.4
N.M.
0
0
N
0 5 Km
Bottom Sediments ng/g
Centrifuged Solids ng/g
Water ng/L
N.M. - Not Measured

FIGURE 5: Mean Hexachlorobenzene (HCB) Levels in Tributaries entering the St. Clair and Detroit Rivers and Lake St. Clair



1158*
31
N.M.
SARNIA
Point Edward
PERCH CK.
GULL DRAIN
N.M. 0
0
COLE DRAIN
BELLE RIVER
17.3
TALFOURD CREEK
Marine City
Sombra
Corunna
1
3.5
0
MURPHY DRAIN
1
1.8
N.M.
0
Port Lambton
0
BABY CREEK
0
2.0
0
Algonac
CHENAL ECARTE
Courtright
PINE R.
N
0 1 2 3 4 5 Km
ST. CLAIR RIVER
*Includes value of 5380 ng/g
N
1
10
0
LAKE ST. CLAIR
SYDENHAM R.
1
1.3
0
0
0.3
0
0
0
0
THAMES R.
PIKE CR.
BELLE R.
0 10 Km
LAKE ST. CLAIR
DETROIT
Belle Isle
Peach Island
LITTLE R.
WINDSOR
2.5
0
0
ROUGE R.
Zug Is.
ECORSE R.
TURKEY CREEK
0 0
0
Fighting Island
WYANDOTTE
CANARD R.
0 0
0
TRENTON
Grosse Isle
AMHERSTBURG
Bois Blanc Island
N.M. 0
0
N
BIG CR.
0 5 Km
DETROIT RIVER
Bottom Sediments ng/g
Centrifuged Solids ng/g
Water ng/L
N.M. - Not Measured

FIGURE 6: Mean Octachlorostyrene (OCS) Levels in Tributaries entering the St. Clair and Detroit Rivers and Lake St. Clair

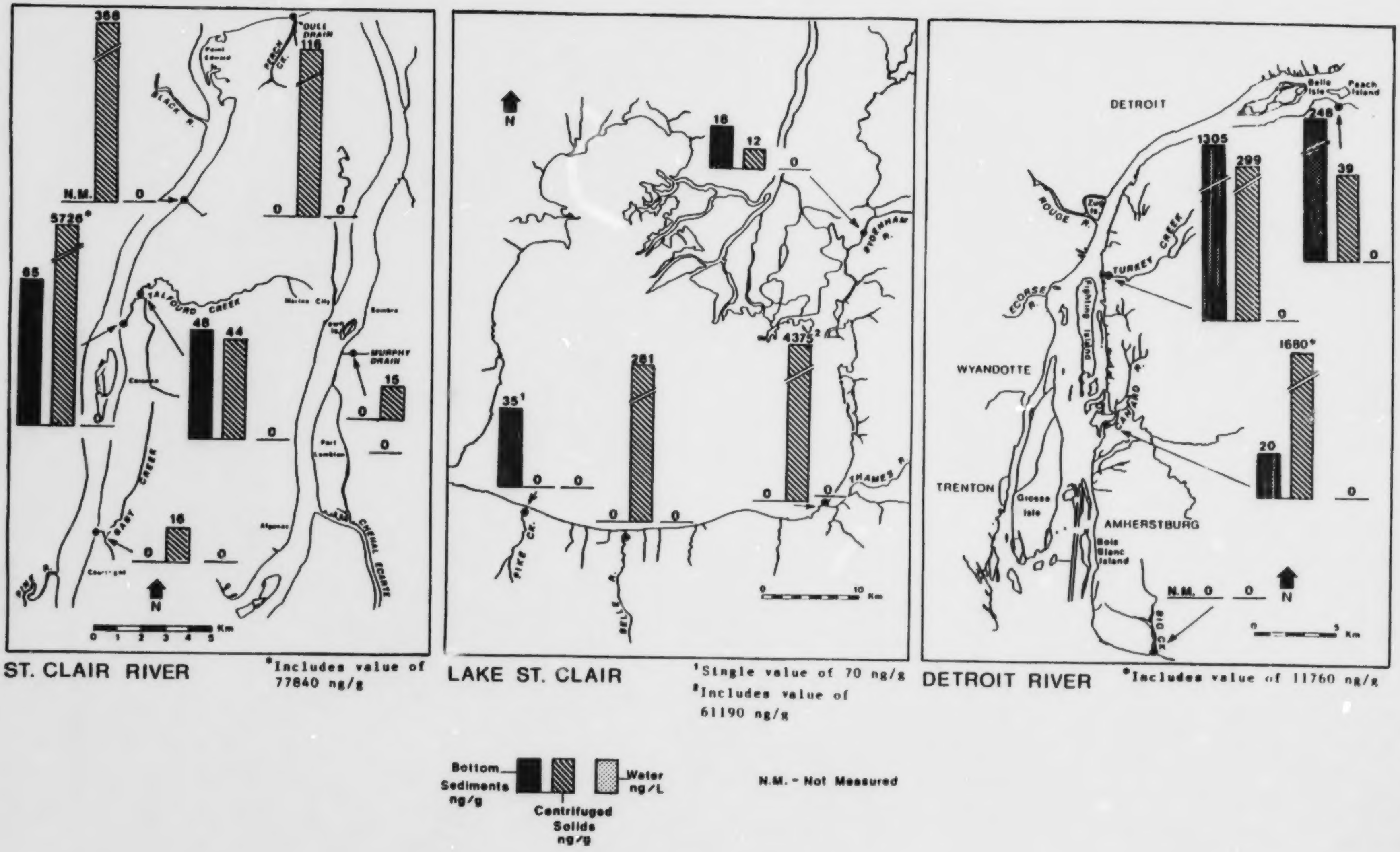
part of the Upper Great Lakes Connecting Channels Study report (UGLCCS 1985; see Appendix I). It should also be noted that while temperature, oxygen and pH profiles were obtained to avoid sampling an area subject to intrusion from the St. Clair River, this may still have occurred. Effects from the Shell refinery outfall will be noted only at the lower Talfourd Creek location as the upper station is situated above any influence from this outfall.

PCB levels on suspended solids at the mouths of tributaries reflect upstream inputs, while the widespread detection of PCBs leads to the conclusion that they are ubiquitous. Nevertheless, very high concentrations were detected on single samples from Talfourd Creek, the Thames River and the Canard River, resulting in high mean concentrations (Figure 7).

The Ontario Ministry of the Environment dredging guideline for the open water disposal of dredged material (50 ng/g) was exceeded in one of two bottom sediment samples from Pike Creek (70 ng/g) and Talfourd Creek (u/s - 70 ng/g; d/s - 65 ng/g). The guideline was consistently exceeded at the Little River and Turkey Creek (Figure 7), with individual values up to 420 and 1815 ng/g, respectively.

Total phenols exceeded the PWQO of 1 µg/L (ppb) in 46% to 100% of all water samples obtained during 1984 and 1985. Phenols may occur naturally as by-products of aquatic plant decomposition as well as from industrial effluents and domestic sewage. A further source arises from the degradation of phenolic pesticides (CCREM, 1987), which may be a significant source, given the intensive agricultural land use of the area.

As indicated previously, water samples from the April, 1984 survey only were submitted for a priority organics scan. Several compounds not identified in the routine organic scans (Table 2) were detected. These included the volatile compounds chloroform, 1,1,1-trichloroethane, 1,2-dichloroethane, carbon tetrachloride, chlorodibromomethane and perchloroethylene at low levels (< 8 µg/L) in Talfourd Creek.



368
N.M.
0
QUILL DRAIN
PERCH CK.
116
0
0
Point Edward
BLACK R.
5726*
65
TALFOURD CREEK
48
44
Marine City
Sombra
Corunna
MURPHY DRAIN
15
0
0
0
Port Lambton
BABY CREEK
16
0
0
Algonac
CHENAL ECARTE
Courtright
PINE R.
N
0 1 2 3 4 5 Km
ST. CLAIR RIVER
*Includes value of 77840 ng/g
N
18
12
0
SYDENHAM R.
35¹
0
0
281
0
0
4375²
0
0
THAMES R.
PIKE CK.
BELLE R.
0 10 Km
LAKE ST. CLAIR
¹Single value of 70 ng/g
²Includes value of 61190 ng/g
DETROIT
Belle Isle
Peach Island
248
39
0
1305
299
0
ROUGE R.
TURKEY CREEK
ECORSE R.
Fighting Island
WYANDOTTE
CANARD R.
1680*
20
0
TRENTON
Grosse Isle
AMHERSTBURG
Bois Blanc Island
N.M. 0
0
N
BIG CK.
0 5 Km
DETROIT RIVER
*Includes value of 11760 ng/g
Bottom Sediments ng/g
Centrifuged Solids ng/g
Water ng/L
N.M. - Not Measured

FIGURE 7: Mean Polychlorinated Biphenyls (PCBs) Levels in tributaries entering the St. Clair and Detroit Rivers and Lake St. Clair

Perchloroethylene was found in samples taken from the Belle River, Baby Creek, Little River, Turkey Creek and the Canard River at levels ranging from 4-12 µg/L.

Turkey Creek samples also contained dichloromethane (22 µg/L), as well as chloroform, 1,1,1-trichloroethane and benzene at concentrations between 2 and 8 µg/L.

Most of the volatile compounds occur as intermediate or end products in the manufacture of chlorinated organic solvents. All have been measured in the St. Clair River near Sarnia (MOE/DOE, 1986; MOE, 1989) and originate from petrochemical industries in the "Chemical Valley". Due to a relatively brief biological and environmental half-life, it is not likely that their detection in tributaries elsewhere reflects inputs at Sarnia; rather, this probably indicates localized uses and inputs.

4.2.2 Inorganics

The distributions of lead (Pb) and cadmium (Cd) in tributaries are illustrated in Figures 8 and 9. Whole water mean concentrations were typically low for lead, and the PWQO of 25 µg/L was exceeded on only one occasion at Turkey Creek (Table 4). The highest mean value of 8 µg/L was observed at the mouth of this creek (range: 3 - 30 µg/L).

The PWQO for cadmium in water was exceeded on at least one occasion at each tributary, but typically in no more than 40% of all samples. In contrast, samples obtained from the Canard River and Turkey Creek exceeded the PWQO in 50% and 75% of samples, respectively (Table 4).

The presence of cadmium in some tributaries draining mainly agricultural areas (such as the Belle River) may be attributed to high cadmium levels associated with fertilizers (Great Lakes Institute, 1986).

Other metals which routinely exceeded PWQOs in water included: aluminum, copper, iron and to a lesser extent zinc (Table 4). Only one sample exceeded the chromium objective of 0.1 mg/L (ppm). This occurred at the Murphy Drain which discharges to the St. Clair River and receives waste

TABLE 4: OCCURRENCE OF TRACE METALS IN WHOLE WATER SAMPLES

TRIBUTARY	ALUMINUM		CADMIUM		CHROMIUM		COPPER		IRON		LEAD		MERCURY		NICKEL		ZINC	
	%>PWQO	n	%>PWQO	n	%>PWQO	n	%>PWQO	n	%>PWQO	n	%>PWQO	n	%>PWQO	n	%>PWQO	n	%>PWQO	n
PERCH CREEK	100	5	40	5	0	5	40	5	100	5	0	5	0	5	0	5	0	5
COLE DRAIN	100	5	33.3	9	0	9	77.8	9	44.4	9	0	9	0	9	0	9	11.1	9
TALFOURD CREEK (d/s)	55.6	9	28.6	14	0	14	92.9	14	50	14	0	14	0	14	0	14	0	14
TALFOURD CREEK (u/s)	100	5	37.5	8	0	8	62.5	8	87.5	8	0	8	0	7	0	8	12.5	8
BABY CREEK	100	4	14.3	7	0	7	87.5	7	100	7	0	7	0	7	0	7	0	7
MURPHY DRAIN	100	4	28.6	7	14	7	71.4	7	100	7	0	7	0	7	0	7	14.3	7
SYDENHAM RIVER	100	9	33.3	12	0	12	75	12	83.3	12	0	12	0	12	0	12	16.7	12
THAMES RIVER	100	7	30.8	13	0	13	84.6	13	100	13	0	13	0	13	0	13	0	13
BELLE RIVER	100	4	33.3	6	0	6	83.3	6	100	6	0	6	0	6	0	6	33.3	6
PIKE CREEK	100	4	33.3	6	0	6	83.3	6	100	6	0	6	0	6	0	6	16.7	6
LITTLE RIVER	100	5	25	8	0	8	75	8	100	8	0	8	0	8	62.5	8	37.5	8
TURKEY CREEK	100	5	75	8	0	8	75	8	62.5	8	12.5	8	0	8	12.5	8	50	8
CANARD RIVER	100	5	50	8	0	8	62.5	8	100	8	0	8	0	8	0	8	12.5	8
BIG CREEK	0	0	0	1	0	1	0	1	100	1	0	1	0	1	0	1	0	1
PWQO	100 µg/L		0.2 µg/L		100 µg/L		5 µg/L		300 µg/L		25 µg/L		0.2 µg/L		25 µg/L		30 µg/L	
MDL	1 µg/L		0.2 µg/L		1 µg/L		1 µg/L		1 µg/L		3 µg/L		0.01 µg/L		1 µg/L		1 µg/L	

MDL - Method Detection Limit
N.A. - Not Available
* - Manitoba guideline
PWQO - Provincial Water Quality Objective
NAP - Not applicable since MDL is >PWQO
n - Number of samples analysed
d/s - Downstream station (at mouth)
u/s - Upstream station

discharges from Chinook Chemicals. Chromium (Cr) and nickel (Ni) in whole water were consistently elevated (Cr: 0.006 - 0.081 mg/L; Ni: 0.016 - 0.200 mg/L) at the mouth of the Little River; hcwever, in the case of chromium, this did not result in levels which exceeded the PWQO. The Little River receives metal plating discharges from Windsor Bumper as well as municipal effluent from the Little River Sewage Treatment plant.

Arsenic levels in water (maximum : 0.005 mg/L) were considerably below the PWQO of 0.100 mg/L.

Metals such as aluminum, cadmium, copper, lead and zinc were frequently elevated above their respective PWQOs and sediment dredging guidelines (see below) at the mouth of Turkey Creek (Table 5); however, this has not been tied directly to specific point sources upstream.

Bottom sediment lead concentrations were generally lower than levels measured on suspended solids (Figure 8), likely due to dilution of the fine-grained, more contaminated sediments with relatively clean, coarse-grained material. One exception was noted for the Little River mouth, where the bottom sediment concentration exceeded levels on suspended solids. The centrifuged samples may not have been representative of longer term depositional trends.

Additional factors may affect the contaminant levels associated with either suspended solids or bottom sediments. These can include the level of organic carbon associated with the solid phase (high TOC levels enhance adsorption of contaminants) as well as high suspended solids concentrations in the water column. The latter factor may result in increased or reduced contaminant levels per unit mass, given different suspended solids loads. The higher Little River bottom sediment lead concentrations may be attributed to the TOC levels, 38% higher than in suspended sediments. The suspended solid concentration in the Little River did not appear to be disproportionately high in comparison with other tributaries (Appendix II).

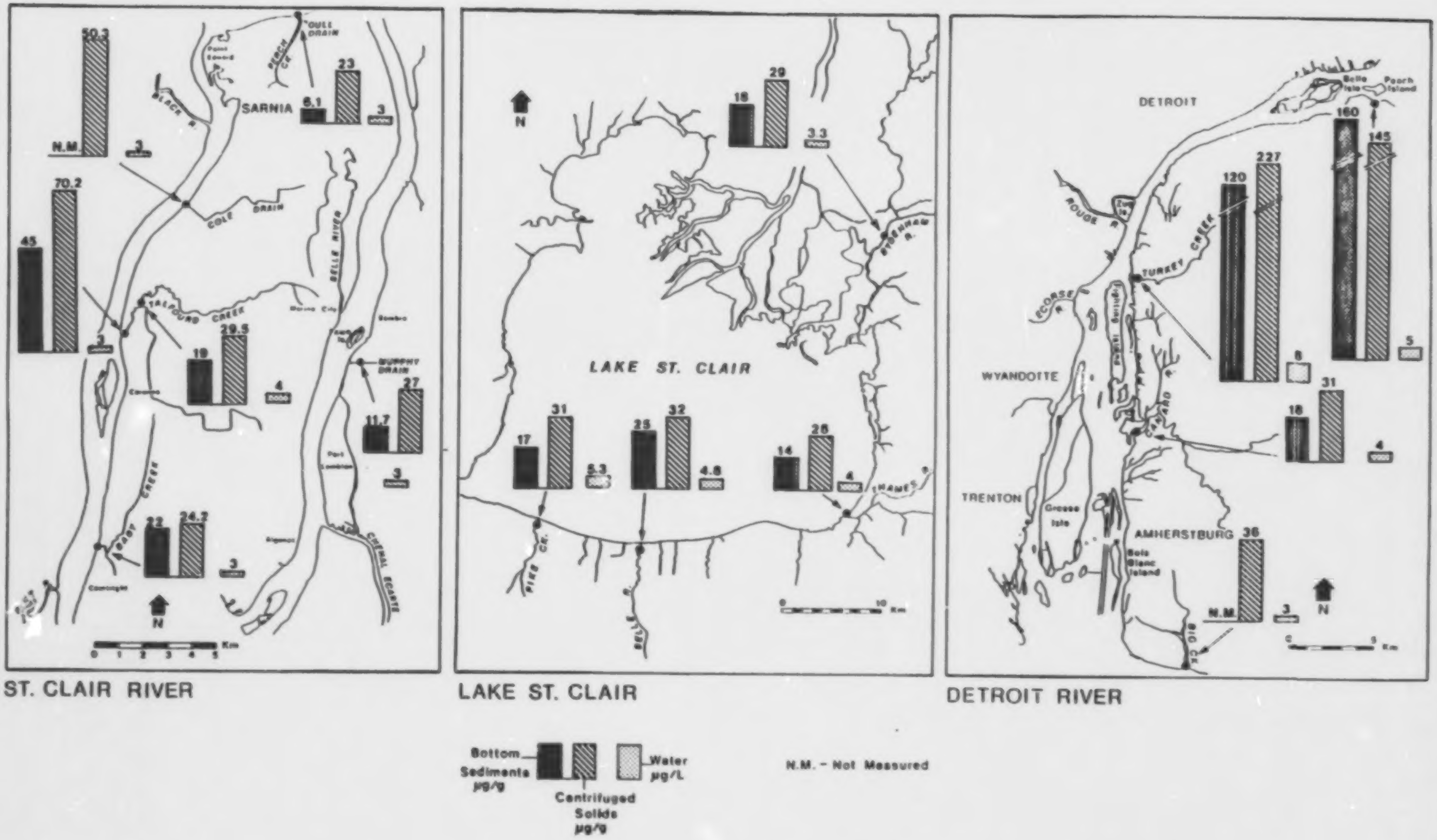

ST. CLAIR RIVER
SARNIA
BLACK R.
PERCH CR.
CULL DRAIN
COLE DRAIN
TALFOURD CREEK
BELLE RIVER
MURPHY DRAIN
BABY CREEK
CHENAL ECARTE
N.M.
50.3
3
45
70.2
3
6.1
23
3
19
29.5
4
11.7
27
3
22
24.2
3
N
0 1 2 3 4 5 Km
LAKE ST. CLAIR
SYDENHAM R.
THAMES R.
PIKE CR.
BELLE R.
N
18
29
3.3
17
31
5.3
25
32
4.8
14
26
4
0 10 Km
DETROIT RIVER
DETROIT
Belle Isle
Peach Island
ROUGE R.
ECORSE R.
TURKEY CREEK
Fighting Island
CANARD R.
WYANDOTTE
TRENTON
Grosse Isle
AMHERSTBURG
Bois Blanc Island
BIG CK.
120
227
8
160
145
5
18
31
4
N.M.
36
3
N
0 5 Km
Bottom Sediments µg/g
Centrifuged Solids µg/g
Water µg/L
N.M. - Not Measured

FIGURE 8: Mean Lead (Pb) Levels in Tributaries entering the St. Clair and Detroit Rivers and Lake St. Clair

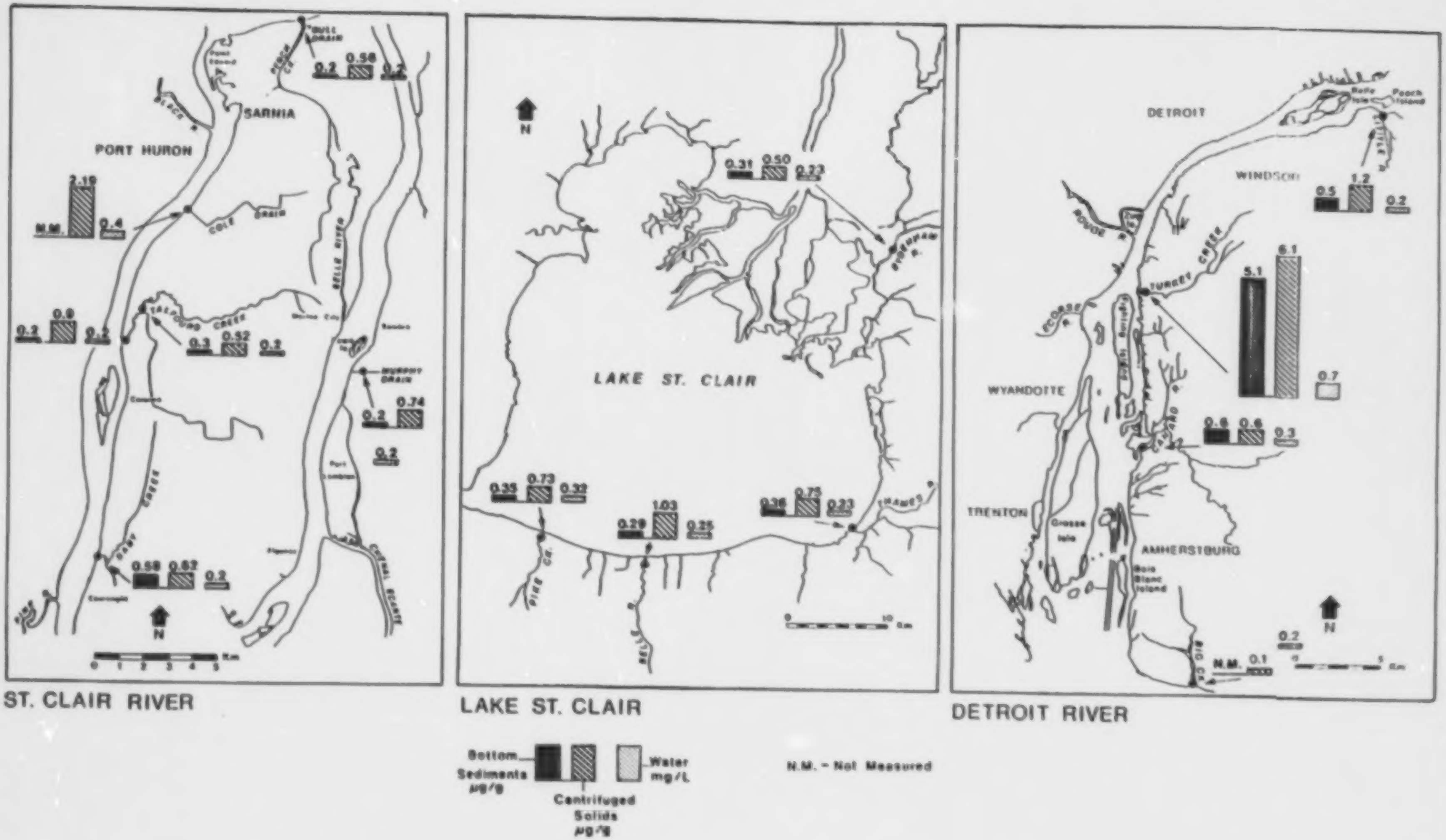

ST. CLAIR RIVER
PORT HURON
SARNIA
BLACK R.
PERCH CR.
BULL DRAIN
0.2
0.58
0.2
N.M.
2.10
0.4
COLE DRAIN
BELLE RIVER
0.2
0.8
0.2
TALFOURD CREEK
0.3
0.52
0.2
MURPHY DRAIN
0.2
0.74
0.2
BABY CREEK
0.58
0.82
0.2
CHENAL ECARTE
PINE R.
N
0 1 2 3 4 5 Km
LAKE ST. CLAIR
N
0.31
0.50
0.23
SYDENHAM R.
LAKE ST. CLAIR
0.35
0.73
0.32
PIKE CR.
0.29
1.03
0.25
BELLE R.
0.36
0.75
0.23
THAMES R.
0 10 Km
DETROIT RIVER
DETROIT
WINDSOR
Belle Isle
Peach Island
LITTLE R.
0.5
1.2
0.2
ROUGE R.
TURKEY CREEK
ECORSE R.
5.1
6.1
0.7
WYANDOTTE
Fighting Island
CANARD R.
0.6
0.6
0.3
TRENTON
Grosse Isle
AMHERSTBURG
Bois Blanc Island
BIG CR.
N.M.
0.1
0.2
N
0 5 Km
Bottom Sediments µg/g
Centrifuged Solids µg/g
Water mg/L
N.M. - Not Measured

FIGURE 9: Mean Cadmium (Cd) Levels in Tributaries entering the St. Clair and Detroit Rivers and Lake St. Clair

Ontario Ministry of the Environment guidelines for the open-water disposal of dredged material (Persaud and Wilkins, 1976) indicate that, with the exception of Turkey Creek, levels of cadmium in bottom sediments from the mouths of all tributaries were below the 1 μg/g (ppm) guideline (Figure 9).

Several additional metals were detected in sediments at levels which exceeded MOE sediment dredging guidelines. Chromium, copper and nickel levels exceeded their 25 μg/g guideline at several tributaries, including the Sydenham and Little Rivers as well as at Turkey Creek (Table 5). The mercury guideline (0.3 μg/g) was exceeded in both sediment samples obtained from the mouths of Talfourd Creek and the Murphy Drain and in one of two samples obtained from the Little River. Zinc concentrations exceeded the 100 μg/g guideline in samples from the mouths of the Little and Canard Rivers and Turkey Creek.

Mean lead concentrations measured on suspended solids were also highest at the mouth of Turkey Creek. A range of 140 to 500 μg/g was observed, with a mean level of 222 μg/g. The highest individual lead concentration in suspended solids (730 μg/g) occurred at the mouth of the Little River.

While MOE dredging guidelines for the disposal of contaminated dredgeate do not apply to suspended solids, it is interesting to briefly compare results for suspended and bottom sediments. The nature of material in suspension is a function of the dynamics and energy of the tributary which carries it. In most instances fine, silty material less than 62 μm in diameter is carried and/or resuspended. This material has a large surface-to-volume or weight ratio and therefore has an affinity for (or capacity for adsorbing) heavy metals (Forstner and Whittmann, 1983) and organic compounds such as PCBs (Kauss and Post, 1987). Conversely, bottom sediments are composed, in part, of larger diameter sand fractions which tend to dilute the overall bed concentration.

Arsenic, cadmium, lead, nickel and zinc concentrations in suspended solids exceeded the MOE dredging guidelines with a much greater frequency

TABLE 5: INORGANICS CONCENTRATIONS EXCEEDING PROVINCIAL SEDIMENT DREDGING GUIDELINES

TRIBUTARY	ARSENIC		CADMIUM		COBALT		CHROMIUM		COPPER		IRON		LEAD		MERCURY		NICKEL		ZINC	
	RSP	BOT	RSP	BOT	RSP	BOT	RSP	BOT	RSP	BOT	RSP	BOT	RSP	BOT	RSP	BOT	RSP	BOT	RSP	BOT
	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.	%>D.G.
PERCH CREEK	0	0	0	0	0	0	100	0	100	0	100	0	0	0	0	0	100	0	80	0
COLE DRAIN	85.7	NS	44.4	NS	0	NS	100	NS	100	NS	100	NS	55.6	NS	71.4	NS	100	NS	100	NS
TALFOURD CK. (d/s)	61.5	0	53.8	0	0	0	100	100	100	100	100	100	69.2	0	80	100	100	0	100	0
TALFOURD CK. (u/s)	87.5	0	0	0	0	0	100	100	100	50	100	100	12.5	0	87.5	0	100	50	100	0
BABY CREEK	100	0	16.7	0	0	0	100	100	100	0	100	100	33.3	0	0	0	83.3	100	100	0
MURPHY DRAIN	57.1	0	28.6	0	0	100	100	100	0	100	100	14.3	0	14.3	0	100	0	0	100	0
SYDENHAM RIVER	81.8	0	20	0	0	100	100	100	100	100	100	100	10	0	0	0	100	100	100	0
THAMES RIVER	57.1	0	28.6	0	0	100	33.3	100	33.3	100	33.3	0	0	0	0	100	0	0	100	0
BELLE RIVER	85.7	0	71.4	0	0	0	100	0	100	0	100	100	0	0	0	0	100	0	100	0
PIKE CREEK	85.7	0	28.6	0	0	0	100	50	100	0	100	100	0	0	0	0	100	0	100	0
LITTLE RIVER	87.5	0	50	0	0	100	100	100	100	100	100	100	62.5	100	14.3	50	100	100	100	100
TURKEY CREEK	100	0	100	100	0	0	100	100	100	100	100	100	100	100	71.4	0	100	100	100	100
CANARD RIVER	87.5	0	25	0	0	0	87.5	50	87.5	50	100	50	0	0	0	0	87.5	50	87.5	50
BIG CREEK	100	NS	0	NS	0	NS	100	NS	100	NS	100	NS	0	NS	0	NS	100	NS	100	NS
DREDGING GUIDELINE	8.0 µg/g		1.0 µg/g		50 µg/g		25 µg/g		25 µg/g		10,000 µg/g		50 µg/g		0.3 µg/g		25 µg/g		100 µg/g	

RSP - Suspended particulates
BOT - Bottom sediments
NS - Not sampled
d/s - Downstream station (at mouth)
u/s - Upstream station

than did bottom sediments obtained from the same location (Table 5). Also of note were the high chromium, copper and mercury concentrations at the mouth of Talfourd Creek and chromium and nickel concentrations from the Little River. Levels of these contaminants detected on suspended solids were one to two orders of magnitude greater than the respective dredging guidelines.

4.3 Non-Point Source Contaminants

Non-point source contaminants may come from a number of diffuse sources including: urban and rural drainage, discharges to municipal waste treatment plants and groundwater.

Receiving water assessment may not be able to distinguish specific process-related compounds following municipal treatment, since wastes may be received from a large number of sources; however, most nutrients and pesticides may be attributed to runoff from agricultural land and/or municipal sources.

4.3.1 Pesticides

The occurrence of pesticides (including insecticides and herbicides) in Ontario surface waters is generally attributed to agricultural use. The four principle factors which facilitate pesticide movement into the aquatic environment include: storm runoff, leaching, spray drift, and spills during application and handling (Murty, 1986). The frequency with which pesticides are detected is further dependent on their persistence and the time of sampling relative to application.

A study of southwestern Ontario watersheds by Braun and Frank (1980) revealed that maximum sediment-associated transport of pesticides occurred between January and April as a result of erosion from high flow spring runoff. Peaks were also coincident with periods of application throughout the growing season.

TABLE 6: OCCURRENCE OF PESTICIDES IN WHOLE WATER SAMPLES

CLASS	HERBICIDE			INSECTICIDE											
TRIBUTARY	ATRAZINE			alpha-BHC			gamma-BHC			p,p'-DDE			ENDRIN		
	%>MDL	%>PWQO	n	%>MDL	%>PWQO	n	%>MDL	%>PWQO	n	%>MDL	%>PWQO	n	%>MDL	%>PWQO	n
PERCH CREEK	50	0	4	0	N.A.	5	20	0	5	0	0	5	0	0	4
COLE DRAIN	60	0	5	55	N.A.	9	11	0	9	0	0	9	25	25	4
TALFOURD CREEK (d/s)	78	0	9	78	N.A.	14	14	0	14	0	0	14	14	14	7
TALFOURD CREEK (u/s)	100	0	4	50	N.A.	8	0	0	8	0	0	8	0	0	4
BABY CREEK	100	0	4	33	N.A.	6	0	0	6	0	0	6	0	0	3
MURPHY DRAIN	75	0	4	85	N.A.	7	14	0	7	0	0	7	0	0	3
SYDENHAM RIVER	43	0	7	25	N.A.	11	8	0	12	0	0	12	0	0	7
THAMES RIVER	25	0	8	42	N.A.	14	29	0	14	7	0	14	0	0	5
BELLE RIVER	25	0	4	83	N.A.	6	17	0	6	17	0	6	0	0	3
PIKE CREEK	50	0	4	40	N.A.	5	0	0	5	40	20	5	0	0	3
LITTLE RIVER	0	0	5	100	N.A.	8	100	50	8	13	0	8	0	0	4
TURKEY CREEK	0	0	5	50	N.A.	8	50	0	8	0	0	8	33	33	3
CANARD RIVER	20	0	5	38	N.A.	8	13	0	8	13	0	8	0	0	4
BIG CREEK	-	-	0	0	N.A.	1	0	0	1	0	0	1	N.A.	N.A.	0
PWQO	200,000 ng/L*			N.A.			10 ng/L			3 ng/L (DDT + metabolites)			2 ng/L		
MDL	50 ng/L			1 ng/L			2 ng/L			1 ng/L			50 ng/L		

PWQO - Provincial Water Quality Objective.
MDL - Method Detection Limit
N.A. - NOT AVAILABLE
n - Number of samples analysed
d/s - Downstream station (at mouth)
u/s - Upstream station

* Calculated IJC objective based on 5% level of median lethal concentration to most sensitive local species at 96 hours (from Frank et al., 1979).

The occurrence of pesticides in water (Table 6) was limited primarily to atrazine, a triazine herbicide used in controlling nuisance weeds for corn production (Frank et al., 1979). Findings from the present investigation concurred with earlier studies (Frank and Sirons, 1979; Frank et al., 1979) in which atrazine was detected mainly in the dissolved phase. In some cases, atrazine was detected in the ng/g (ppb) range on suspended solids (Appendix II); however, the detection frequency was low (Table 7).

As previously indicated, runoff is a significant means of transporting pesticides to receiving waters. Compounds with solubilities approaching or exceeding the solubility of atrazine (70 mg/L at 25°C - Merck Index, 1968) are transported primarily in solution. Atrazine on suspended solids accounted for very little of the whole water atrazine load (Table 10). Concentrations up to 8450 ng/L were measured in whole water (Appendix II); however, this maximum was still well below the calculated IJC objective of 200,000 ng/L identified in Frank et al., (1979) for the protection of *Daphnia magna*. Atrazine inputs were mainly restricted to the St. Clair River and Lake St. Clair tributaries. Loadings were greatest from the Thames and Sydenham Rivers, ranging from about 20 to nearly 600 times those of the smaller, slower flowing tributaries.

The phenoxy-acid herbicides, picloram, silvex, 2,4-D and 2,4,5-T were detected in several tributaries at levels up to 250 ng/g on suspended solids (Table 7). With the exception of picloram, detected in single samples from the Little River and Turkey Creek, phenoxy acid herbicides were not detected in whole water samples. The PWQO for 2,4-D is 4 µg/L.

One suspended solid sample obtained from the Cole Drain contained 6601 ng/g sencor, a triazine herbicide. It is difficult to determine the significance of this value, given that no water quality criteria exist. This was likely a result of sampling coincident with time of application and may reflect a minor spill during handling or application. The Cole Drain receives runoff from undeveloped as well as developed lands,

TABLE 7: OCCURRENCE OF HERBICIDES ON SUSPENDED PARTICULATE MATERIAL

TRIBUTARY	ATRAZINE		PICLORAM		SILVEX		2,4-D		2,4,5-T	
	%>MDL	n	%>MDL	n	%>MDL	n	%>MDL	n	%>MDL	n
PERCH CREEK	0	3	0	2	50	2	0	2	50	2
COLE DRAIN	33.3	3	0	1	0	1	0	1	0	1
TALFOURD CREEK (d/s)	0	5	0	0	0	0	0	0	0	0
TALFOURD CREEK (u/s)	0	3	0	1	0	1	0	1	100	1
BABY CREEK	0	2	0	0	0	0	0	0	0	0
MURPHY DRAIN	0	2	0	1	0	1	0	1	0	1
SYDENHAM RIVER	0	6	50	2	50	2	0	2	50	2
THAMES RIVER	0	2	0	1	0	1	0	1	100	1
BELLE RIVER	100	1	0	1	0	1	0	1	0	1
PIKE CREEK	0	1	0	1	0	1	0	1	0	1
LITTLE RIVER	0	2	100	1	0	1	100	1	0	1
TURKEY CREEK	0	2	0	1	0	1	0	1	0	1
CANARD RIVER	0	2	0	3	0	3	33.3	3	0	3
BIG CREEK		0		0		0		0		0
MDL	50 ng/g		100 ng/g		50 ng/g		100 ng/g		50 ng/g	

MDL - Method detection limit
n - Number of samples analysed
d/s - Downstream station (at mouth)
u/s - Upstream station

industrial waste disposal and product storage areas, treated and untreated runoff and industrial process effluent and cooling water (MOE, 1989).

Other pesticides detected in whole water included α-BHC and γ-BHC (lindane), which are fairly soluble (1-10 mg/L) organochlorine insecticides occurring in up to 100% of water samples (see Little River - Table 6). Of these, only α-BHC was detected on suspended particulate material, though in fewer samples (0-33%, Table 8). Alpha-BHC is not used as an insecticide and typically occurs as an impurity in lindane (CCREM, 1987). Endrin and p,p'-DDE objectives (2 and 3 ng/L respectively - Table 6) were exceeded in no more than one sample from each of several tributaries.

Additional pesticides detected on suspended solids from a number of tributaries (Appendix II and Table 8) included α- and β- endosulphan (0-33% of samples) as well as p,p'-DDE (0-86%), p,p'-DDT (0-67%) and heptachlor epoxide (0-50%). Other pesticides detected less frequently on suspended solids included β-BHC (0-28%), α-chlordane (0-57%), γ-chlordane (0-57%), dieldrin (0-71%), endrin (0-43%) and methoxychlor (0-43%) (Appendix II).

The presence of dieldrin in tributaries is of concern since it is not registered for agricultural use in Canada. Dieldrin is registered for termite control only and has been banned in the U.S.A since 1974. A similar concern is raised with respect to the presence of p,p'-DDT, particularly in Detroit River tributaries and one Lake St. Clair tributary on suspended solids (Table 8). This compound was registered only for an extremely narrow range of applications and was recently banned altogether in Ontario (January, 1989). Dieldrin as well as the DDT metabolite p,p'-DDE appeared to be quite ubiquitous, since they were detected in almost all tributaries studied (Table 8). These concerns may be somewhat tempered by the fact that both dieldrin and DDT are extremely stable compounds with lengthy soil half-lives and their detection may represent historical use.

TABLE 8: OCCURRENCE OF INSECTICIDES ON SUSPENDED PARTICULATE MATERIAL

TRIBUTARY	alpha-BHC		alpha-ENDOSULPHAN		beta-ENDOSULPHAN		HEPTACHLOR EPOXIDE		p,p'-DDE		p,p'-DDT		DIELDRIN	
	%>MDL	n	%>MDL	n	%>MDL	n	%>MDL	n	%>MDL	n	%>MDL	n	%>MDL	n
PERCH CREEK	0	5	0	5	0	5	0	5	20	5	0	5	20	5
COLE DRAIN	25	8	25	8	12.5	14	50	8	42.9	7	0	8	71.4	7
TALFOURD CREEK (d/s)	0	14	17	14	17	7	17	14	14.3	14	0	14	50	14
TALFOURD CREEK (u/s)	0	7	0	7	0	7	14.3	7	42.9	7	0	7	42.9	7
BABY CREEK	14.3	7	28.6	7	14.3	7	0	7	42.9	7	0	7	42.9	7
MURPHY DRAIN	0	7	28.6	7	0	8	0	7	71.4	7	0	7	57.1	7
SYDENHAM RIVER	0	12	8.3	12	0	12	0	12	75	12	0	12	41.7	12
THAMES RIVER	0	12	25	12	0	12	8.3	12	78.6	14	0	14	41.7	12
BELLE RIVER	0	7	0	7	0	7	14.3	7	71.4	7	0	7	29	7
PIKE CREEK	14.3	7	14.3	7	0	7	0	7	100	7	42.8	7	42.9	7
LITTLE RIVER	0	7	0	7	0	1	0	7	85.7	7	14.3	7	42.9	7
TURKEY CREEK	33.3	6	33.3	6	33.3	6	0	6	83.3	6	66.7	6	50	6
CANARD RIVER	14.3	7	14.3	7	0	7	14.3	7	71.4	7	28.6	7	14.3	7
BIG CREEK	N.A.	0	0	1	0	1	0	1	100	1	0	1	0	1
MDL	1 ng/g		2 ng/g		4 ng/g		2 ng/g		1 ng/g		1 ng/g		1 ng/g	

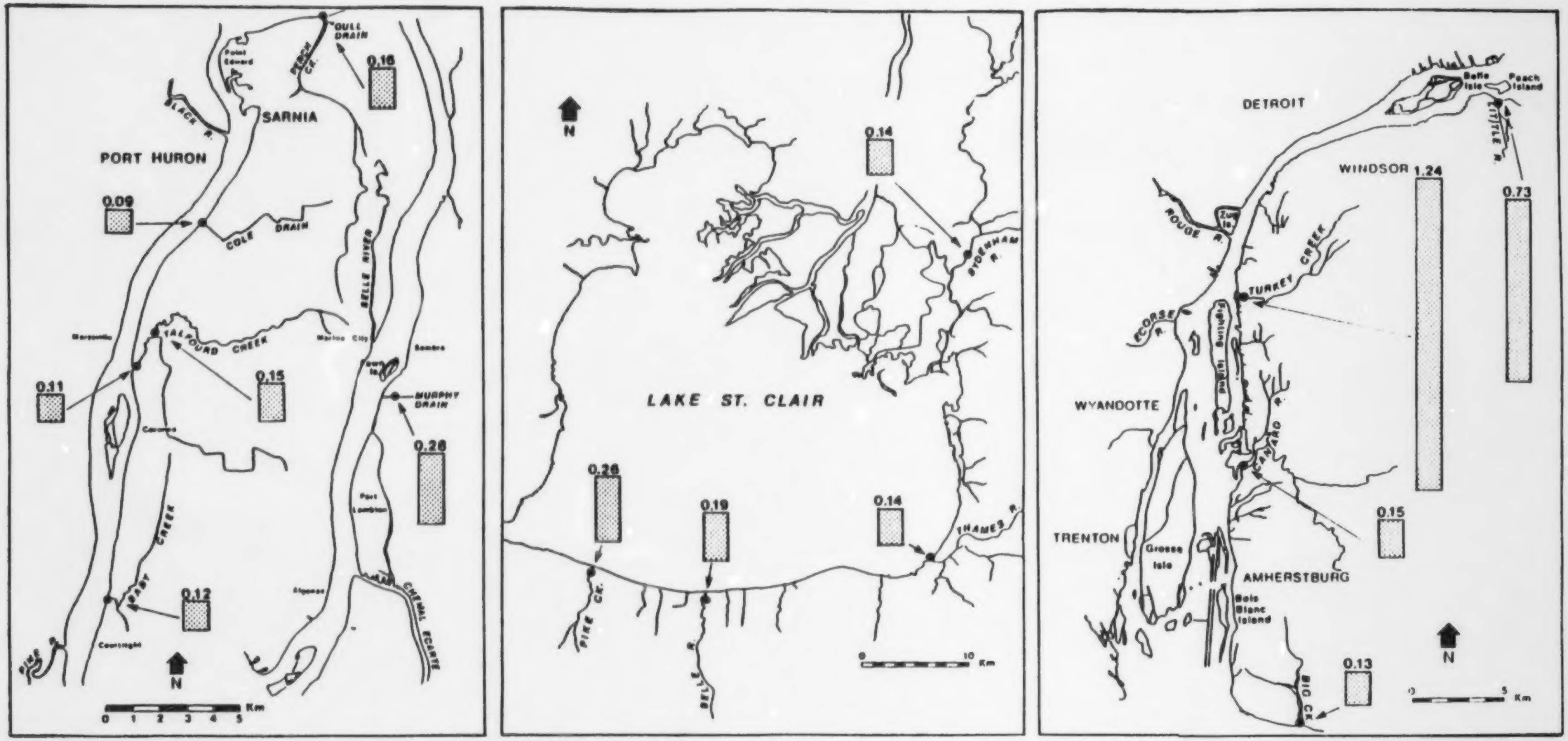
MDL - Method Dection Limit
n - Number of samples analysed
d/s - Downstream station (at mouth)
u/s - Upstream station
NOTE: Single measured value of 6601 ng/g for sencor at the Cole Drain (85/07/03).

4.3.2 Nutrients and Chloride

Mean whole water phosphorus concentrations were highest at the mouth of Turkey Creek (1.24 mg/L) and the Little River (0.73 mg/L - Figure 10). The Ontario guideline for phosphorus (0.03 mg/L) to prevent excessive plant growth in rivers and streams was exceeded in all samples from all tributaries (Appendix II). A peak concentration of 4.3 mg/L was measured in July, 1985 at the mouth of Turkey Creek, possibly coincident with fertilizer application and runoff. Mean phosphorus concentrations in the St. Clair and Detroit Rivers ranged from 0.009 to 0.025 mg/L (Johnson and Kauss, 1987).

Chloride concentrations (Figure 11) reflect possible industrial or municipal sources. The highest mean concentrations were observed in Turkey Creek (90 mg/L), the Little River (80 mg/L) and the Cole Drain (75 mg/L). It is interesting to note that the mean chloride level at the upper Talfourd Creek site was almost twice that observed at the mouth, suggesting that this sampling location may be in proximity to a potential source (perhaps road run-off). Once-through cooling water discharged from Shell Canada contained between 24 and 430 mg/L chloride during a 1986 investigation (UGLCCS, 1989) while cooling water drawn from this area of the St. Clair River would contain about 11 mg/L chloride (Johnson and Kauss, 1987). In addition to industrial and municipal inputs, road salting is often responsible for elevated chloride levels during spring runoff; however, peak concentrations occurred in August 1984 (120 mg/L) and July 1985 (143 mg/L), thereby precluding the latter as a likely source.

Total Kjeldahl nitrogen (TKN) concentrations (Appendix II) closely mimicked the spatial distribution of total phosphorus, with the notable exception of the Murphy Drain. Concentrations measured in this drain, which receives process wastewater from Chinook Chemicals Ltd., ranged from 1.6 to 189 mg/L with a mean value of 36.5 mg/L. TKN includes both organic- and ammonia- nitrogen, and the latter is typically present at concentrations of 1 - 3 mg/L in Chinook Chemicals effluent (Edwardson and King, 1988). The high concentrations in this tributary may represent upset conditions or the contribution from amines to the TKN concentration.

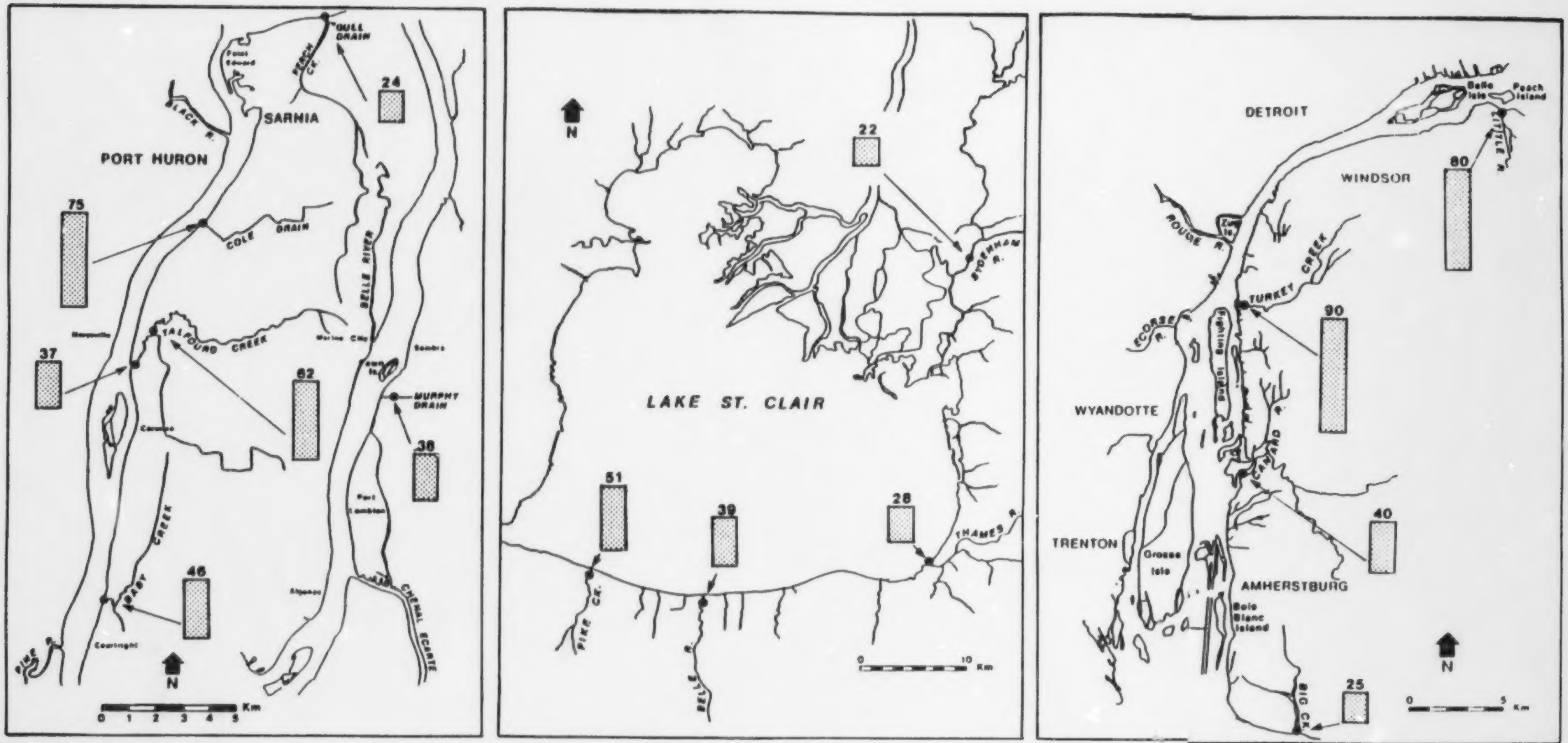

PORT HURON
SARNIA
BLACK R.
Point Edward
PERCH CR.
QUILL DRAIN
0.16
0.09
COLE DRAIN
BELLE RIVER
TALFOURD CREEK
0.11
0.15
MURPHY DRAIN
0.28
BABY CREEK
0.12
Courtright
CHENAL ECARTE
PINE R.
N
0 1 2 3 4 5 Km
LAKE ST. CLAIR
0.14
SYDENHAM R.
0.28
0.19
0.14
PIKE CR.
BELLE R.
THAMES R.
0 10 Km
DETROIT
Belle Isle
Peach Island
LITTLE R.
WINDSOR
1.24
0.73
ROUGE R.
Zug Is.
TURKEY CREEK
ECORSE R.
Fighting Island
CANARD R.
WYANDOTTE
TRENTON
Grosse Isle
AMHERSTBURG
Bois Blanc Island
0.15
0.13
BIG CR.
0 5 Km

ST. CLAIR RIVER

LAKE ST. CLAIR

DETROIT RIVER

FIGURE 10: Mean Total Phosphorus (TP) Levels in whole water (mg/L) from tributaries entering the St. Clair and Detroit Rivers and Lake St. Clair


GULL DRAIN
PERCH CR.
Point Edward
BLACK R.
SARNIA
PORT HURON
24
75
COLE DRAIN
BELLE RIVER
TALFOURD CREEK
Marine City
Sombra
37
62
MURPHY DRAIN
38
Corunna
Port Lambton
BABY CREEK
46
Courtright
PINE R.
CHENAL ECARTE
N
0 1 2 3 4 5 Km
N
22
SYDENHAM R.
LAKE ST. CLAIR
51
39
28
THAMES R.
PIKE CR.
BELLE R.
0 10 Km
DETROIT
Belle Isle
Peach Island
LITTLE R.
WINDSOR
80
ROUGE R.
Zug Isl.
ECORSE R.
TURKEY CREEK
90
Fighting Island
WYANDOTTE
CANARD R.
40
TRENTON
Grosse Isle
AMHERSTBURG
Bois Blanc Island
N
BIG CK.
25
0 5 Km

ST. CLAIR RIVER

LAKE ST. CLAIR

DETROIT RIVER

FIGURE 11: Mean Chloride (Cl -) Levels in whole water (mg/L) from tributaries entering the St. Clair and Detroit Rivers and Lake St. Clair

A priority pollutants scan of a sample from the Murphy Drain could not be performed by conventional GC techniques due to its complex composition. Subsequent analysis by GC/MS methods provided additional information on the structure of the compounds present; however, no complex amines were detected (as might be expected given that Chinook produces ammonia-based agricultural products).

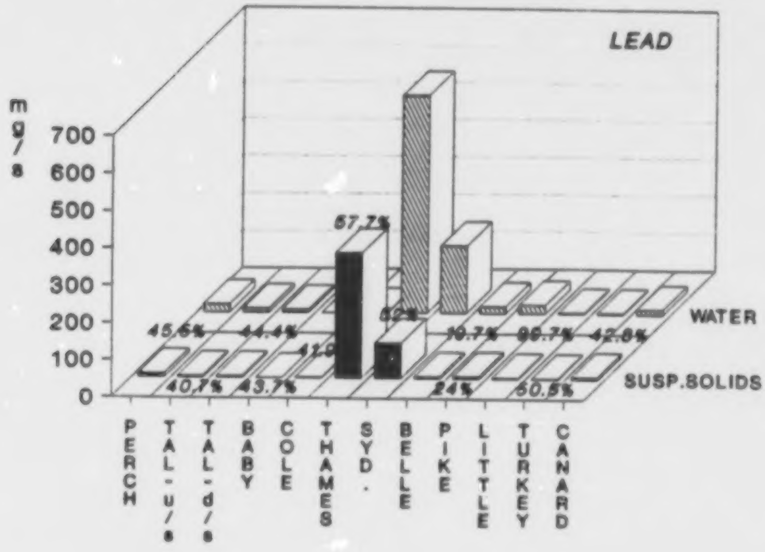
4.4 Relative Loading Contributions

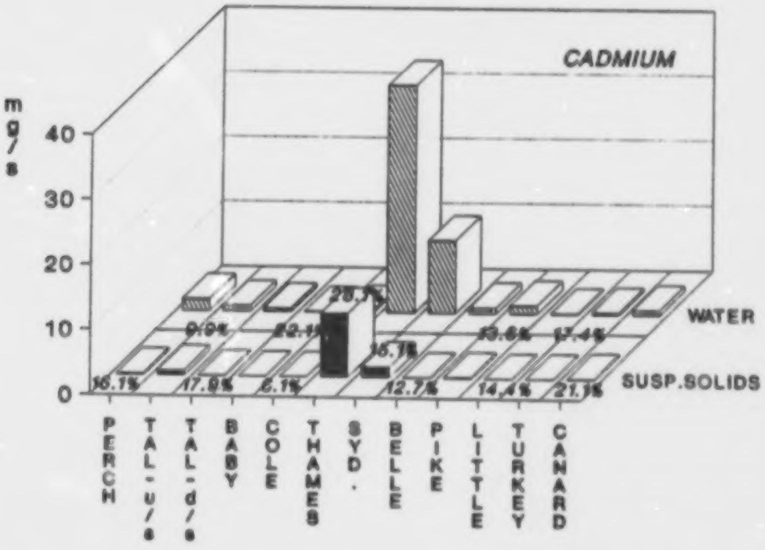
A limited sampling frequency (maximum of 14 samples at any one tributary over the two-year period) precluded the calculation of annual loadings for the tributaries monitored. increased sampling effort would be necessary to extrapolate to such a period of time with any degree of confidence.

An important consideration when understanding non-point source inputs is their significance relative to point sources, particularly in the event that point source control is achieved. A useful indicator of the relative importance of each tributary involves comparing instantaneous loads based on concurrent flow and concentration data. For many parameters, the Thames and Sydenham Rivers were the greatest sources, due largely to their high flow rates. For example, while the highest lead and cadmium concentrations in water, suspended solids and bottom sediments occurred in the Turkey Creek and the Little River, loadings of these as well as other metals were much higher from the Thames and Sydenham Rivers (Figure 12; Table 9).

Total (whole water) loadings of inorganics from all sampled tributaries were dominated by iron and aluminum (>500,000 mg/sec), followed by manganese, zinc, copper, nickel and chromium (>1,000 mg/sec), then by lead, cobalt, arsenic and selenium (>100 mg/sec) and lastly by mercury (<10 mg/sec) (Table 9). Overall, suspended solids carried the majority of the total aluminum, iron, manganese, chromium, lead and zinc loadings and about half of arsenic inputs. In contrast, the majority of cadmium, cobalt, copper, mercury, nickel and selenium loadings were associated with the aqueous phase.

FIGURE 12: Mean Instantaneous Lead and Cadmium Loadings to the St. Clair and Detroit Rivers and Lake St. Clair (mg/sec)





Note: Suspended solid load as a fraction of whole water load (%)

TABLE 9: MEAN INSTANTANEOUS LOADING VALUES FOR INORGANICS (mg/sec)

TRIBUTARY	ALUMINIUM		ARSENIC		CADMIUM		CHROMIUM		COBALT		COPPER		IRON	
	SUSP. SOL	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL	WATER	SUSP.SOL.	WATER
PERCH CREEK	10,901	10,211	3.31	7.58	0.29	1.82	27.32	26.84	6.95	14.41	15.73	41.76	11,777	13,287
TALFOURD CREEK (d/s)	2,027	2,041	0.99	3.86	0.08	0.85	12.47	12.86	1.32	7.46	9.20	33.02	2,749	2,335
TALFOURD CREEK (u/s)	2,457	3,055	1.48	2.32	0.10	0.55	6.90	11.57	2.13	5.17	5.14	15.76	4,725	4,925
BABY CREEK	442	540	0.15	0.34	0.02	0.07	0.71	1.76	0.26	0.51	1.08	2.51	536	578
COLE DRAIN	261	264	0.24	0.81	0.02	0.36	1.47	2.43	0.23	0.90	4.46	13.50	485	373
THAMES RIVER	279,128	323,367	96.57	211.53	9.86	35.06	513.58	848.76	173.62	495.52	506.72	1,103.47	386,237	439,701
SYDENHAM RIVER	129,901	164,795	39.33	50.19	1.69	11.17	211.54	409.19	63.28	144.38	161.79	487.98	146,649	227,521
BELLE RIVER	3,679	12,833	1.27	5.99	0.12	0.91	5.69	24.21	1.69	14.64	4.58	23.80	4,866	15,294
PIKE CREEK	3,606	11,476	2.02	5.83	0.18	1.30	8.92	37.03	2.62	20.67	10.97	33.16	6,366	18,013
LITTLE RIVER	1,469	1,785	0.62	0.91	0.03	0.20	8.46	20.78	0.66	1.67	3.14	5.79	1,788	2,543
TURKEY CREEK	299	326	0.16	0.72	0.06	0.32	1.48	3.14	0.18	1.00	1.24	3.62	415	493
CANARD RIVER	6,086	10,698	2.32	2.48	0.16	0.75	9.52	17.99	3.02	8.50	7.12	17.04	7,813	12,916
TOTAL	440,256	541,391	148.46	292.56	12.61	53.36	808.06	1,416.56	255.96	714.83	731.17	1,781.41	574,406	737,979
% OF WATER	81%		51%		24%		57%		36%		41%		78%	

d/s - Downstream station (at mouth)

u/s - Upstream station

TABLE 9: (CONT'D) MEAN INSTANTANEOUS LOADING VALUES FOR INORGANICS (mg/sec)

TRIBUTARY	LEAD		MANGANESE		MERCURY		NICKEL		SELENIUM		ZINC	
	SUSP. SOL	WATER	SUSP. SOL	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL	WATER
PERCH CREEK	10.36	22.74	170.00	255.24	0.015	0.093	15.48	49.63	0.63	7.58	47.21	96.00
TALFOURD CREEK (d/s)	4.71	11.58	6.70	17.63	0.035	0.078	4.20	14.26	0.17	2.74	21.79	43.17
TALFOURD CREEK (u/s)	3.92	8.82	23.52	35.90	0.063	0.059	5.18	9.41	0.10	1.46	23.59	38.54
BABY CREEK	0.45	1.03	2.20	3.93	0.001	0.004	0.68	1.49	0.02	0.27	2.82	5.94
COLE DRAIN	1.03	2.43	2.64	5.49	0.006	0.019	0.82	4.14	0.01	0.45	6.17	12.33
THAMES RIVER	336.69	583.19	2,352.55	2,997.20	0.604	3.281	401.28	838.20	13.42	97.99	1,570.36	2,635.46
SYDENHAM RIVER	93.91	180.52	1,559.25	1,770.16	0.198	0.992	169.20	413.26	11.42	38.83	551.04	1,083.20
BELLE RIVER	3.72	18.86	10.92	55.07	0.007	0.096	4.85	21.53	0.11	2.25	22.19	82.57
PIKE CREEK	5.68	23.58	18.10	53.06	0.009	0.099	5.66	25.57	0.06	2.33	26.97	90.27
LITTLE RIVER	3.34	3.34	9.65	22.37	0.005	0.022	9.00	37.79	0.11	0.54	12.95	26.16
TURKEY CREEK	1.83	3.62	4.28	22.98	0.003	0.014	0.92	5.60	0.03	0.42	6.92	23.63
CANARD RIVER	6.48	15.14	20.28	24.76	0.011	0.031	7.77	18.34	0.10	2.02	31.96	63.38
TOTAL	472.12	874.85	4,180.09	5,263.79	0.957	4.788	625.04	1,439.22	26.18	156.88	2,323.97	4,200.65
% OF WATER	54%		79%		20%		43%		17%		55%	

d/s - Downstream station (at mouth)

u/s - Upstream station

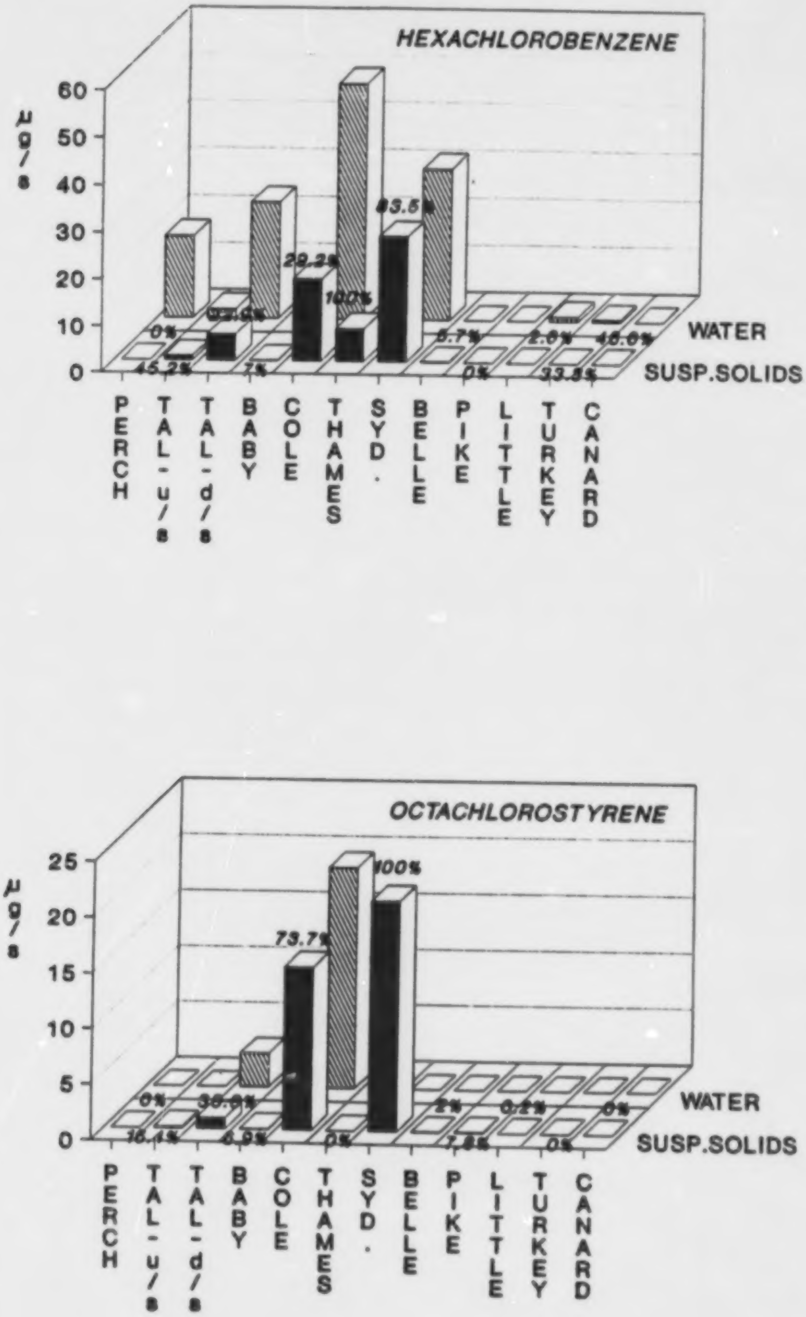
Loadings of HCB and OCS (Figure 13; Table 10) from the Thames and Sydenham Rivers were similar in magnitude to that of the Cole Drain, since measured concentrations from the latter were up to two orders of magnitude higher than in the rivers (Figures 5 - 6). In contrast to many metals, the proportion of the HCB loads carried by suspended solids was usually lower (i.e., <50%) although it increased to up to 100% in the Thames and Sydenham Rivers. For OCS, most of the loading was associated with suspended solids. The Cole Drain, Talfourd Creek, and the Thames and Sydenham Rivers were the major sources of HCB and OCS as well as HCE and HCBD, whereas the bulk of pentachlorophenol originated from Talfourd Creek, the Cole Drain and the Turkey Creek. PCBs were only detected on suspended solids. High concentrations were found in single samples from Talfourd Creek and the Thames and Canard Rivers, which made these tributaries the dominant sources of this contaminant (Table 10). With the exception of PCBs, chlorinated organics loadings were much lower (i.e., <1 mg/sec) than inorganics inputs. Phenols loadings, particularly from the Thames and Sydenham Rivers, were of the same magnitude as some metals.

A 1987 preliminary report of findings from the MOE St. Clair River MISA Pilot Site Investigation (MOE, 1987) focused on point source loadings from Dow and Polysar. A comparison of loadings from the Dow 42-inch sewer and the Cole Drain, major sources of HCB and OCS in previous studies, (MOE/DOE, 1986; MOE, 1987; MOE, 1989; UGLCCS, 1989) versus tributary loadings reveals some interesting relationships. Loadings of HCB in some tributaries (Talfourd Creek, Sydenham River, Cole Drain) approached the industrial point source loadings from the Dow 42-inch sewer, while OCS was of the same order of magnitude in some tributaries (Figure 14).

Contributions from the Sydenham and Thames Rivers represent intermittent or patchy sources of contaminants. However, the importance of these sources should not be overlooked, and more intensive watershed management studies may be necessary to document the origin of these compounds.

In contrast to the organic compounds noted above, two conventional parameters, total phosphorus and chloride, were dominated by tributary inputs when compared to loads emitted by the Dow 42-inch sewer

FIGURE 13: *Mean Instantaneous HCB and OCS Loadings to the St. Clair and Detroit Rivers and Lake St. Clair (µg/sec)*



Note: Suspended solid load as a fraction of whole water load (%)

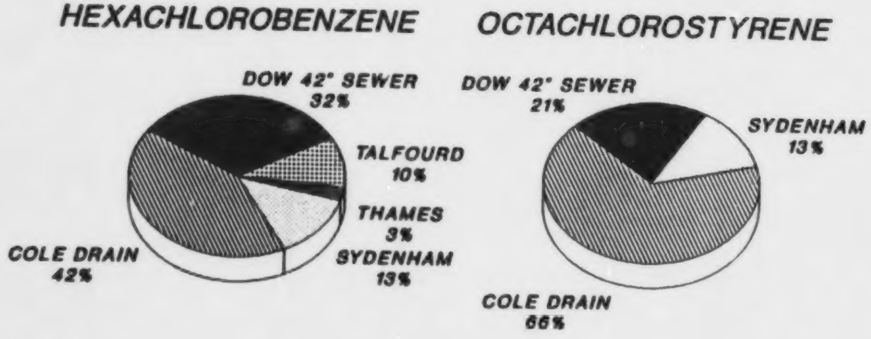
TABLE 10: MEAN INSTANTANEOUS LOADING VALUES FOR INDUSTRIAL ORGANICS (µg/sec)

TRIBUTARY	HEXACHLOROETHANE		HEXACHLORO-BUTADIENE		HEXACHLORO-BENZENE		OCTACHLOROSTYRENE		TOTAL PCBs		PHENOLS		PENTACHLOROPHENOL	
	SUSP.SOL.	WATER	SUSP.SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER
PERCH CREEK	NA	0.00	NA	0.00	0.00	17.58	0.00	0.00	41.55	0.00	NA	13,421	0.00	0.00
TALFOURD CREEK (d/s)	NA	19.59	NA	4.72	5.68	24.82	1.01	3.03	812.26	0.00	NA	15,339	0.00	62.78
TALFOURD CREEK (u/s)	NA	0.58	NA	16.02	0.91	2.02	0.16	0.00	10.82	0.00	NA	2,377	0.00	0.00
BABY CREEK	NA	0.00	NA	0.19	0.08	0.00	0.07	0.00	0.30	0.00	NA	662	0.00	0.00
COLE DRAIN	NA	61.65	NA	58.95	17.57	50.04	14.59	19.80	3.99	0.00	NA	16,470	0.22	10.08
THAMES RIVER	NA	24.02	NA	0.00	7.07	0.00	0.00	0.00	147,506	0.00	NA	471,318	0.00	0.00
SYDENHAM RIVER	NA	0.80	NA	25.29	26.84	32.13	20.63	0.00	60.08	0.00	NA	158,925	0.00	0.00
BELLE RIVER	NA	0.00	NA	2.32	0.06	0.00	0.08	0.00	95.37	0.00	NA	16,567	0.00	0.00
PIKE CREEK	NA	0.00	NA	0.41	0.00	0.00	0.00	0.00	0.00	0.00	NA	4,752	0.00	0.00
LITTLE RIVER	NA	0.20	NA	0.18	0.03	1.03	0.00	0.00	3.47	0.00	NA	2,216	0.00	0.00
TURKEY CREEK	NA	0.00	NA	0.00	0.02	0.48	0.00	0.00	4.58	0.00	NA	1,093	0.00	11.70
CANARD RIVER	NA	0.41	NA	1.98	0.03	0.06	0.00	0.00	1,418	0.00	NA	4,366	0.00	0.00
TOTAL	NA	107.25	NA	110.06	58.29	128.16	36.54	22.83	149,957	0.00	NA	707,506	0.22	84.56
% OF WATER	NA		NA		45%		160%		-				0.3%	

d/s - Downstream station (at mouth)

u/s - Upstream station

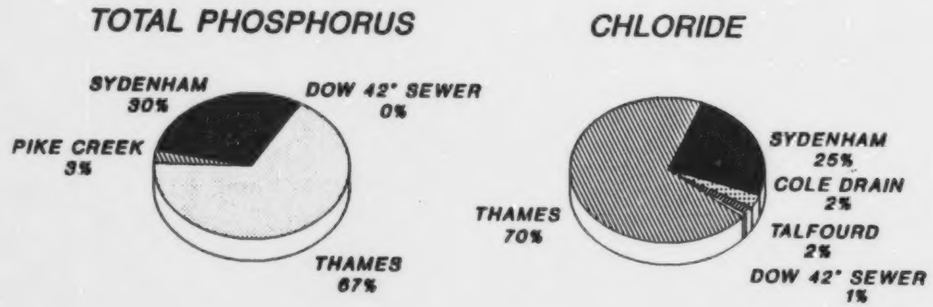
FIG 14: LOADING COMPARISON:
TRIBUTARIES vs. SELECTED POINT SOURCES*


HEXACHLOROBENZENE

OCTACHLOROSTYRENE

* 05/86-03/87 DOW mean loadings (MOE)

FIG 15; LOADING COMPARISON: TRIBUTARIES vs. SELECTED POINT SOURCES*



* 05/86-03/87 DOW mean loadings (MOE)

(Figure 15). Nevertheless, according to the St. Clair River MISA Pilot Site Investigation (MOE, 1989), chloride inputs from the Dow 4th Street sewer contribute annual loads greater than that of all sampled tributaries combined, given a mean chloride concentration of 823 mg/L.

Land use in Ontario along the Lake Huron - Erie corridor is primarily agricultural and similar in use characteristics. The occurrence and relative loadings of most pesticides reflects this common use pattern (Tables 8 and 11). Exceptions appear to occur for atrazine and p,p'-DDE. Loadings of the former are much lower in tributaries to the Detroit River than in tributaries entering the St. Clair River and Lake St. Clair. In contrast, estimated loadings of p,p'-DDE in tributaries to the St. Clair River were lower than inputs observed in Lake St. Clair and the Detroit River. Furthermore, the entirety of the p,p'-DDT and p,p'-DDD loads were contributed by Pike Creek in Lake St. Clair and the three Detroit River tributaries. The major sources of atrazine were the Thames and Sydenham Rivers (combined total of 30,540 µg/sec) and the major source of p,p'-DDE was the Thames River (48.3 µg/sec). Loadings of some other pesticides were also highest in the Sydenham and Thames Rivers (Table 11). For example, in the Thames River, loadings were 7.7, 0.97 and 0.80 µg/sec for dieldrin, methoxychlor and α-endosulphan, respectively. Loadings from the Sydenham River were typically less than 50% of the Thames River loads, with the exception of endrin, for which the estimated loading (2.5 µg/sec) was 25 times greater from the Sydenham River than from the Thames River.

Although almost all of the atrazine, α-BHC and γ-BHC loadings were carried in the aqueous phase, virtually the entire dieldrin, α-endosulphan, p,p'-DDE, p,p'-DDD, p,p'-DDT, endrin and methoxychlor loadings were associated with suspended solids (Table 11).

4.4.1 Tributary Loadings Relative to Connecting Channel Loadings

A 1984 survey was conducted by the MOE to evaluate mass loading differences between the head and mouth of the St. Clair and Detroit Rivers, respectively (Johnson and Kauss, 1987). A comparison of these loading differences with tributary inputs allows one to assess the relative significance of the latter.

TABLE 11: MEAN INSTANTANEOUS LOADING VALUES FOR PESTICIDES (µg/sec)

STATION	ATRAZINE		alpha-BHC		gamma-BHC		DIELDRIN		alpha-ENDOSULPHAN		p,p'-DDE	
	SUSP. SOL	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER
PERCH CREEK	0.0	944	0.00	0.00	0.00	4.95	0.37	0.00	0.00	0.00	0.03	0.00
TALFOURD CREEK (d/s)	0.0	744	0.00	10.07	0.03	0.86	0.81	0.00	1.05	0.00	0.00	0.00
TALFOURD CREEK (u/s)	0.0	2,973	0.00	2.65	0.00	0.21	0.39	0.00	0.00	0.00	0.04	0.00
BABY CREEK	0.0	271	0.001	0.09	0.00	0.00	0.02	0.00	0.01	0.00	0.02	0.00
COLE DRAIN	0.6	89	0.04	2.52	0.01	0.36	0.16	0.00	0.13	0.00	0.08	0.00
THAMES RIVER	0.0	13,433	0.00	153.03	0.00	58.00	7.74	0.00	0.80	0.00	48.34	48.00
SYDENHAM RIVER	0.0	17,107	0.00	37.07	0.00	3.85	3.14	0.00	0.01	0.00	3.87	0.00
BELLE RIVER	11.3	521	0.00	5.63	0.00	0.01	0.08	0.00	0.00	0.00	0.20	0.70
PIKE CREEK	0.0	1,779	0.01	3.09	0.00	0.00	0.25	0.00	0.10	0.00	2.16	5.01
LITTLE RIVER	0.0	0	0.00	1.74	0.00	8.07	0.17	0.00	0.00	0.00	0.70	0.35
TURKEY CREEK	0.0	0	0.001	0.47	0.00	1.42	0.10	0.00	0.17	1.88	0.29	0.00
CANARD RIVER	0.0	33	0.01	0.51	0.00	3.95	0.34	0.00	0.03	0.00	0.98	3.95
TOTAL	11.9	37,894	0.06	216.87	0.04	81.68	13.57	0.00	2.30	1.88	56.71	58.01
% OF WATER	0.03%		0.03%		0.05%		100%		121%		98%	

d/s - Downstream station (at mouth)
u/s - Upstream station

TABLE 11: (CONT'D) MEAN INSTANTANEOUS LOADING VALUES FOR PESTICIDES (µg/sec)

STATION	p,p'-DDD		p,p'-DDT		ENDRIN		METHOXYCHLOR	
	SUSP. SOL	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER	SUSP. SOL.	WATER
PERCH CREEK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TALFOURD CREEK (d/s)	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.00
TALFOURD CREEK (u/s)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BABY CREEK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COLE DRAIN	0.00	0.00	0.00	0.00	0.04	0.00	0.40	0.00
THAMES RIVER	0.00	0.00	0.00	0.00	0.10	0.00	0.97	0.00
SYDENHAM RIVER	0.00	0.00	0.00	0.00	2.48	0.00	0.49	0.00
BELLE RIVER	0.00	0.00	0.00	0.00	0.002	0.00	0.00	0.00
PIKE CREEK	1.22	0.00	0.98	0.00	0.00	0.00	0.00	0.00
LITTLE RIVER	0.30	0.00	0.45	0.00	0.00	0.00	0.83	0.00
TURKEY CREEK	0.17	0.00	0.20	0.00	0.07	0.00	0.32	0.00
CANARD RIVER	0.00	0.00	2.76	0.00	0.00	0.00	0.00	0.00
TOTAL	1.69	0.00	4.39	0.00	2.69	0.00	3.75	0.00
% OF WATER	100%		100%		100%		100%	

d/s - Downstream station (at mouth)
u/s - Upstream station

The 1984 head and mouth study provided an estimate of net loading increases in each river from all sources. These load estimates for selected parameters were based on ambient concentrations measured at head and mouth transects in each river and on known connecting channel discharge volumes.

Table 12 compares loadings from Ontario tributaries measured in the present study as a percentage of total inputs to each of the St. Clair and Detroit Rivers and to Lake St. Clair for the parameters considered for the 1984 study.

The importance of Ontario tributary loadings relative to other sources (e.g., point source, non-point source, atmospheric etc.) appears to be quite minimal in the St. Clair and Detroit Rivers (i.e., usually less than a percent, with a maximum of 4.4%) with the exception of PCBs in the St. Clair River, 27% of which were contributed by tributaries.

As outlined in Johnson and Kauss (1987), Lake St. Clair appears to act as a contaminant sink and/or release vector, as loadings are reduced between the mouth (outlet) of the St. Clair River and the head of the Detroit River for all parameters except PCBs, with major reductions in mercury, zinc, HCB and OCS (Table 12).

Unlike the two connecting channels, tributaries to Lake St. Clair appear to account for most, if not all, suspended solids, dissolved organic carbon, chloride, phosphorus, iron and PCBs inputs (within expected error), while lead contributions from tributaries are minimal. This is particularly important, because data on loadings from Michigan tributaries was not obtained as part of this study. Tributaries would be expected to contribute a significant fraction of pesticide loadings to the connecting channels; however, this would be mainly contingent on the time of pesticide application and sampling.

Given the low sampling frequency, the expected error in estimating loadings, both in tributaries and in the St. Clair and Detroit Rivers, suggests that caution should be exercised in using these results. At best, this comparison provides an estimate of the relative importance of tributary contributions.

TABLE 12: MAGNITUDE OF TRIBUTARY LOADINGS RELATIVE TO RIVER SYSTEM LOADINGS (mg/sec).

BODY OF WATER	PARAMETER										
	SUSPENDED SOLIDS	DISSOLVED ORG. CARBON	CHLORIDE	PHOSPHORUS	LEAD	IRON	MERCURY	ZINC	HEXACHLORO-BENZENE	OCTACHLORO-STYRENE	TOTAL PCBs
St. Clair River:											
Δ Head-Mouth[1]	54×10^6	9.8×10^6	50×10^6	55×10^3	18×10^5	8.1×10^5	75.3	11×10^3	8.9	2.1	3.0
Σ Trib. Inputs[2]	0.13×10^6	0.02×10^6	0.21×10^6	0.95×10^3	15.0	0.03×10^5	0.10	61.4	0.075	0.023	0.82
Tributary Inputs as % Of River	0.2	0.2	0.4	1.7	0.0008	0.4	0.1	0.6	0.8	1.1	27
Lake St. Clair:											
Δ Head-Mouth[1]	0.46×10^6	0.51×10^6	3.0×10^6	19×10^3	9.7×10^5	4.4×10^5	-63.7	0	-8.7	-2.0	40
Σ Trib. Inputs[2]	16×10^6	1.2×10^6	5.1×10^6	35×10^3	806	7.0×10^5	4.47	3.9×10^3	0.032	0.021	148
Tributary Inputs as % Of River	3,478	235	170	185	0.08	159	-	-	-	-	369
Detroit River:											
Δ Head-Mouth[1]	37×10^6	0.74×10^6	3.2×10^6	80×10^3	22×10^5	13×10^5	69.6	19×10^3	2.3	2.4	-24
Σ Trib. Inputs[2]	0.28×10^6	0.02×10^6	0.14×10^6	1.2×10^3	22.1	0.16×10^5	0.07	113	0.001	0	1.43
Tributary Inputs as % Of River	0.8	2.7	4.4	1.5	0.001	1.2	0.10	0.6	0.04	0	-

[1] = Net change in loading between head and mouth of St. Clair and Detroit Rivers and Lake St. Clair in 1984. (Johnson and Kauss, 1987).

[2] = Sum of loadings from Ontario tributaries sampled in 1984-1985. (The largest of whole water or suspended particulates - associated loadings was used).

a "-" indicates that % could not be calculated due to net loss in Lake St. Clair .

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this investigation, it can be concluded that:

i) While the presence of most pesticides is related to time of sampling versus time of application, several pesticides which have been restricted in use, such as dieldrin and DDT, were found at detectable levels in whole water, suspended solids and bottom sediments. It cannot be concluded from the information collected whether these residues are due to persistence or to recent applications; however, the predominance of breakdown or daughter products in some tributaries (e.g., Thames River) may indicate historical use.

- **It is therefore recommended that possible sources of DDT and dieldrin be investigated in watersheds of the following tributaries: Talfourd Creek, Pike Creek and Turkey Creek.**

ii) Chloride (Cl^-) levels were higher in the upper Talfourd Creek than at the Creek mouth.

- **It is recommended that the possible source of this elevated Cl^- and potentially related industrial contaminants such as hexachlorobenzene and octachlorostyrene be investigated, focusing on known landfill sites which may impact Talfourd Creek.**

iii) Uncharacterized leachate migrating from a disposal site which formerly received wastes from Ford, Chrysler, General Motors and Hiram Walker may be contaminating shallow groundwater that subsequently enters the Little River.

- **It is therefore recommended that samples of leachate from this site and others which have not been documented, be characterized to assess their potential for impact on the ecosystem.**

iv) Bear Creek, which ultimately discharges to Lake St. Clair is potentially an intermediate receiver of leachate from a number of landfill sites (GTC, 1986).

- **It is recommended that any further tributary investigations include Bear Creek in order to document its water quality and contribution of contaminants.**

v) Hexachlorobenzene and octachlorostyrene, as well as other industrial organics, were intermittently detected in several tributaries including Talfourd Creek and the Sydenham River. A relatively high frequency of occurrence was noted at the Cole Drain, probably due to upstream landfill leachate and runoff. Elevated mercury concentrations on suspended solids at the mouth of Talfourd Creek and high PCBs levels on suspended solids from Talfourd Creek, The Thames River and Turkey Creek (albeit on isolated samples), also gives rise for concern.

- **It is recommended that possible sources of these contaminants be identified and that the significance and frequency of their intermittent occurrence be assessed through more intensive watershed management studies. These studies should include the use of biomonitors to integrate these intermittent sources and provide a more sensitive indication of contaminant pulses.**

vi) Heavy metal and PCB concentrations in Turkey Creek were elevated above numerous provincial water quality objectives and sediment dredging guidelines. Potential sources of these contaminants appear to be industrial and municipal (septic) inputs to the Grand Marais drain and Turkey Creek, although these sources need to be further defined.

- **It is recommended that a more comprehensive investigation be undertaken to identify and quantify specific sources in the Turkey Creek watershed.**

6.0 REFERENCES

Braun, H.E. and R. Frank, 1980. Organochlorine and organophosphorus insecticides: their use in eleven agricultural watersheds and their loss to stream waters in southern Ontario, Canada, 1975-1977, Sci. Total Environ., 15, 169.

CCREM, 1987. Canadian Water Quality Guidelines. Task Force on Water Quality Guidelines of the Canadian Council of Resource and Environment Ministers.

Edwardson, D.E. and L. King, 1988. Geographic Area Report: St. Clair River Canadian Point sources. Submitted to the Upper Great Lakes Connecting Channels Study.

Environment Canada, 1984 - 1985. Monthly Meteorological Summary. Atmospheric Environment Service.

Environment Canada, 1984 - 1985. Surface Water Data. Inland Waters Directorate, Water Survey of Canada.

Forstner, V. and G.T.W. Wittman, 1983. Metal pollution in the aquatic environment. Second revised edition. Springer-Verlag New York, New York. 486pp.

Frank, R., G.J. Sirons, R.L. Thomas, and K. McMillan, 1979. Triazine residues in suspended solids (1974 - 1976) and water (1977) from the mouths of Canadian Streams flowing into the Great Lakes. J. Great Lakes Res. 5 (2): 131-138.

Frank, R. and G.J. Sirons, 1979. Atrazine: Its use in corn production and its loss to stream waters in Southern Ontario, 1975 - 1977. Science Total Environ. 12: 223 - 239.

Gaudenzi, D., 1988. Ontario Ministry of the Environment, Southwest Region, Sarnia District Office. Personal Communication.

Great Lakes Institute, 1986. A Case Study of Selected Toxic Contaminants in the Essex Region. Volume I: Physical Sciences. 329 pp.

GTC Geologic Testing Consultants Ltd., 1986. Regional Characterization and Waste Site Inventory. Volume I. 256 pp. and Appendices.

Hamdy, Y.S. and G.D. Johnson, 1987. Report on the Bacteriological Quality of the Detroit River, 1975-1984. Ontario Ministry of the Environment, Water Resources Branch, 44 pp.

Hamdy, Y.S. and L. Post, 1985. Distribution of mercury, trace organics and other heavy metals in Detroit River sediments. J. Great Lakes Res. 11(3) 353-365.

International Joint Commission, 1985. Great Lakes Water Quality Board: 1985 Report on Great Lakes Water Quality.

Johnson G.D. and P.B. Kauss, 1987. Estimated Contaminant Loadings to the St. Clair and Detroit River - 1984. Ministry of the Environment, Water Resources Branch.

Kaiser, K.L.E., M.E. Comba, H. Hunter, R.J. Maguire, R.J. Tkacz and R.F. Platford, 1985. Trace organic contaminants in the Detroit River. J. Great Lakes Res. 11(3): 386-399.

Kaminsky R. and R.A. Hites, 1984. Octachlorostyrene in Lake Ontario: Sources and Fates. Environ. Sci. Technol. 18, 275 - 279.

Kauss, P.B. and L.E. Post, 1987. Contaminant Concentrations in bottom sediments of the Sir Adam Beck Power Reservoir and Niagara River Bar dredgeate. Ontario Ministry of the Environment, Water Resources Branch, 40 pp.

Kauss, P.B. and Y.S Hamdy. 1985. Biological monitoring of organochlorine contaminants in the St. Clair and Detroit rivers using introduced clams Elliptio complanata. J. Great Lakes Res., 11(3) 247-263.

Kinkead, J. and Y.S. Hamdy, 1976. Report on a Bacteriological Survey along the Ontario shoreline of the Detroit River, Ontario Ministry of the Environment, Water Resources Branch.

Merck Index - 8th Edition, 1968. An Encyclopedia of Chemicals and Drugs. Merck and Co. Inc. Rathway, N.J.

MOE/DOE, 1986. St. Clair River Pollution Investigation Report. Sarnia Area. 135 pp. & appendices.

MOE/DOE, 1988. Implementation of Recommendations of the 1986 St. Clair River Pollution Investigation Report. ISBN 0-7729-3531-9, 30 pp.

Murty, A.S., 1986. Toxicity of Pesticides to Fish - Volume I. CRC Press Inc., Boca Raton, Florida. pp. 11 - 36.

Ontario Ministry of the Environment, 1983. Handbook of analytical Methods for Environmental Samples. Laboratory Services Branch, Rexdale, Ont.

Ontario Ministry of the Environment, 1985. A Guide to the Collection and Submission of Samples for Laboratory Analysis. Laboratory Services Branch, Rexdale, Ontario.

Ontario Ministry of the Environment, 1987. Preliminary Report St. Clair River MISA Pilot-Site Investigation, Volume I: Parts I & II. G.D. Johnson, editor.

Ontario Ministry of the Environment, 1989. Final Report St. Clair River MISA PIlot Site Investigation, Parts I, II and III. G.D. Johnson, editor (draft report).

Paraschak, M., 1988. Ontario Ministry of the Environment, Southwest Region, Windsor District Office. Personal Communication.

Persaud, D. and W.D. Wilkins, 1976. Evaluating Construction Activities Impacting on Water Resources. Ontario Ministry of the Environment, Water Resources Branch.

Upper Great Lakes Connecting Channels Study, 1985. Work Plan of Activities. August, 1985.

Upper Great Lakes Connecting Channels Study Management Committee, 1989. Volume II - Final Report of the Upper Great Lakes Connecting Channels Study. Environment Canada/United States Environmental Protection Agency/Michigan Department of Natural Resources/Ontario Ministry of the Environment/National Oceanographic and Atmospheric Administration/U.S. Fish and Wildlife Service/U.S. Army Corps of Engineers/Detroit Water and Sewage Department.

Wall, G.J., E.A. Pringle and T. Dickenson, 1987. Agricultural sources of pollution - executive summary. Non-point source work group draft report for submission to the Upper Great Lakes Connecting Channels Study. Prepared for Environment Canada, Pollution Abatement Division.

Wells, D.L., 1985. Tetrachloroethylene. Summary of sources, occurrence and characteristics. Ministry of the Environment, Water Resources Branch. Unpublished report.

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APPENDICES

APPENDIX I

UGLCCS Non-point source (NPS) work group activities:

- Survey of waste sites and assembly of existing data (Canada).
- Survey of waste sites where groundwater contamination is suspected or known to be occurring and assembly of existing data (U.S.A.).
- Preliminary designation of potentially hazardous sites (Canada and U.S.).
- Site specific investigations to obtain required data where necessary for prioritized waste sites and calculation of loadings.
- Deep well disposal assessment, Lambton County, Ontario.
- An assessment of the seepage of groundwater into the St. Clair River.
- Inventory of NPS impacts based on water quality sediment and biota data for the tributary mouths.
- Inventory of significant urban storm water discharges.
- Pesticide/fertilizer use inventory by County (and watershed in Ontario).
- Agricultural inventory of tillage practices by County (U.S.).
- Agricultural inventory of soil and water conservation practices by county in Ontario (Canada).
- Animal wastes facility inventory by county.
- Atmospheric data search for phosphorus and pesticide deposition.
- 1986-87 Agricultural and urban NPS follow-up.
- Geophysical and hydrological determination of the groundwater flux through the bottom sediments of the Upper Connecting Channels.

APPENDIX II

DETAILED FINDINGS BY MEDIA

APPENDIX II NOTES

1. In the following tables, values less than the method detection limit are represented by zero.

2. Stations can be identified by Body of Water and Station No. as follows:

Body of Water 4: Lake St. Clair
Station No: 1. Thames River
2. Sydenham River
3. Belle River
4. Pike Creek

Body of Water 8: Lake Huron
Station No.: 6. Perch Creek/Gull Drain

Body of Water 10: Detroit River
Station No: 5. Little River
6. Turkey Creek
7. Big Creek

Body of Water 15: St. Clair River
Station No.: 3. Talfourd Creek (mouth)
4. Talfound Creek (upstream)
5. Baby Creek
6. Murphy Drain
7. Cole Drain

WATER QUALITY RESULTS

1984-1985 TRIBUTARY SURVEY
WATER-- CONVENTIONALS/PHYSICAL

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	CHLORIDE mg/L	DIC mg/L	DOC mg/L	HARDNESS mg/L	SUSPENDED SOLIDS mg/L	PRECIPITATION mm	DISCHARGE CMS
1	4	1	840414	30006	11	27	39.00	3.60		34.90	6.5	56.80
1		1	840414	30007	14	27	35.00	3.50		38.30	6.5	56.80
2		1	840817	30409	11	41	33.80	4.20		16.49	0.0	14.80
2		1	840817	30410	14	41	33.70	4.20		16.85	0.0	14.80
3		1	841114	36159	11	30	46.00	6.10		68.78	0.0	180.80
3		1	841114	36160	14	31	46.00	6.20		76.96	0.0	180.80
4		1	850305	10972	11	22	28.00	5.40	178	100.30	26.8	336.30
4		1	850305	10973	14	22	27.80	5.40	181	92.27	26.8	336.30
5		1	850322	10999	11	18	40.00	3.20	218	32.07	0.6	188.20
5		1	850322	11000	14	18	38.00	3.30	218	37.66	0.6	188.20
6		1	850707	11861	11	33	37.00	3.70	217	29.26	0.2	14.40
6		1	850707	11862	14	33	39.00	3.70	217	29.59	0.2	14.40
8		1	851117	16973	11	25	47.00	6.50	277	107.30	12.4	241.10
8		1	851117	16974	14	25	47.00	6.80	276	108.20	12.4	241.10
				MEAN:		28	38.38	4.70	223	56.35214	6.642857	147.4857
				MIN:		18	27.80	3.20	178	16.49	0	14.4
				MAX:		41	47.00	6.80	277	108.2	26.8	336.3
				STD. DEV.:		7	6.23	1.26	34.70501	33.17618	9.302512	113.8440
				n:		14	14	14	8	14	14	14
1		2	840415	30009	11	25	35.00	4.10		30.60	12.4	15.20
2		2	840810	30406	11	16	27.40	3.00		14.75	12.4	3.20
3		2	841112	36158	11	51	41.50	7.70		44.36	27.2	118.00
4		2	850303	10968	11	15	26.40	5.90	160	85.30	0.0	120.40
5		2	850316	10996	11	18	35.20	5.00	209	32.01	0.0	65.90
5		2	850316	10997	14	18	35.20	5.10	211	28.91	0.0	65.90
6		2	850706	11860	11	22	24.80	2.50	127	20.68	4.0	2.90
7		2	850825	16455	11	15	21.60	2.30	123	11.22	62.1	1.30
7		2	850825	16456	14	15	21.60	2.40	123.5	12.30	62.1	1.30

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	CHLORIDE mg/L	DIC mg/L	DOC mg/L	HARDNESS mg/L	SUSPENDED SOLIDS mg/L	PRECIPITATION mm	DISCHARGE CMS
7	4	2	850908	16466	14	31	34.00	5.90	228.5	38.23	46.2	15.40
8		2	851115	16967	11	21	35.00	8.30	219	171.30	2.2	96.40
8		2	851115	16968	14	22	34.60	8.10	223	169.40	2.2	96.40
				MEAN:		22	31.03	5.03	180	54.92167	19.23333	50.19167
				MIN:		15	21.60	2.30	123	11.22	0	1.3
				MAX:		51	41.50	8.30	228.5	171.3	62.1	120.4
				STD. DEV.:		10	6.12	2.13	43.68158	54.97575	23.24014	46.50402
				n:		12	12	12	9	12	12	12
2		3	840827	30412	11	43	40.50	7.10		29.71	0.0	0.01
3		3	841115	36162	11	70	31.70	8.90		31.71	2.7	4.49
4		3	850306	10975	11	17	13.80	7.00	107	66.54	0.0	5.92
5		3	850319	11004	11	41	40.00	5.20	330	15.60	0.0	0.59
6		3	850707	11864	11	33	34.20	8.00	232	30.86	0.2	0.02
8		3	851118	16976	11	27	30.20	10.40	220	45.62	11.6	6.95
				MEAN:		39	31.73	7.77	222	36.67333	2.416667	2.996667
				MIN:		17	13.80	5.20	107	15.6	0	0.01
				MAX:		70	40.50	10.40	330	66.54	11.6	6.95
				STD. DEV.:		17	8.90	1.63	79.04548	15.93248	4.219959	2.886103
				n:		6	6	6	4	6	6	6
2		4	840828	30413	11	71	32.60	7.50		31.29	3.2	
3		4	841116	36163	11	77	41.50	8.20		68.49	2.7	
4		4	850308	10980	11	27	22.00	6.80	168	144.40	1.1	5.77
5		4	850320	11006	11	57	45.00	4.40	356	8.90	0.0	
6		4	850708	11865	11	45	35.40	7.40	248	68.80	0.2	
8		4	851118	16977	11	31	41.00	8.60	273	35.80	11.6	1.23

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	CHLORIDE mg/L	DIC mg/L	DOC mg/L	HARDNESS mg/L	SUSPENDED SOLIDS mg/L	PRECIPITATION mm	DISCHARGE CMS
				MEAN:		51	36.25	7.15	261	59.61267	3.133333	3.5
				MIN:		27	22.00	4.40	168	8.896	0	1.23
				MAX:		77	45.00	8.60	356	144.4	11.6	5.77
				STD. DEV.:		19	7.57	1.36	67.05734	43.38491	3.967227	2.27
				n:		6	6	6	4	6	6	2
4	8	6	850228	10963	11	18	31.00	6.00	173	80.46	1.6	7.76
5		6	850313	10986	11	22	45.00	6.10	255	61.04	1.8	6.19
6		6	850701	11852	11	34	35.80	4.00	207	78.08	1.2	
7		6	850823	16453	11	27	28.00	3.50	158.5	74.52	0.0	
8		6	851111	16961	11	20	47.00	8.60	269	60.61	4.0	8.79
				MEAN:		26	37.36	5.64	213	70.9412	1.72	7.58
				MIN:		18	28.00	3.50	158.5	60.61	0	6.19
				MAX:		34	47.00	8.60	269	80.46	4	8.79
				STD. DEV.:		6	7.51	1.81	43.60046	8.476137	1.299846	1.069049
				n:		5	5	5	5	5	5	3
1	10	5	840408	30003	11	45	31.90	4.30		24.70	0.0	0.70
2		5	840816	30408	11	37	20.90	2.30		8.48	0.0	0.05
3		5	841116	36164	11	128	34.30	5.00		28.18	2.7	0.54
4		5	850309	10982	11	72	33.20	5.50	218	70.54	0.0	1.41
5		5	850320	11007	11	52	29.00	3.70	184	27.82	0.0	0.13
6		5	850708	11866	11	137	27.60	3.70	151	18.27	0.2	0.06
7		5	850908	16464	11	136	27.00	4.10	166	25.81	17.6	0.65
8		5	851119	16978	11	36	33.80	7.00	219	115.70	15.2	2.09

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	CHLORIDE mg/L	DIC mg/L	DOC mg/L	HARDNESS mg/L	SUSPENDED SOLIDS mg/L	PRECIPITATION mm	DISCHARGE CMS
				MEAN:		80	29.71	4.45	188	39.93775	4.4625	0.70375
				MIN:		36	20.90	2.30	151	8.482	0	0.05
				MAX:		137	34.30	7.00	219	115.7	17.6	2.09
				STD. DEV.:		43	4.25	1.31	27.31007	33.26454	6.971538	0.672792
				n:		8	8	8	5	8	8	8
1	10	6	840407	30002	11	113	51.00	6.90		7.21	0.2	0.44
2		6	840828	30414	11	56	42.50	5.60		26.93	3.2	0.11
3		6	841117	36165	11	107	56.00	5.10		18.86	0.0	0.17
4		6	850306	10976	11	95	44.00	5.00	290	24.96	0.0	1.04
5		6	850317	11002	11	126	55.00	4.40	340	3.47	0.2	0.20
6		6	850709	11867	11	81	47.00	6.00	239	4.01	1.0	0.17
7		6	850907	16462	11	77	29.80	5.60	176	45.66	27.8	0.75
8		6	851119	16979	11	64	52.00	5.80	284	34.75	15.2	1.17
				MEAN:		90	47.16	5.55	266	20.73063	5.95	0.50625
				MIN:		56	29.80	4.40	176	3.466	0	0.11
				MAX:		126	56.00	6.90	340	45.66	27.8	1.17
				STD. DEV.:		23	7.99	0.70	55.1449	16.31050	9.565433	0.397836
				n:		8	8	8	5	8	8	8
1		7	840405	30000	11	28	27.30	6.10		89.30	10.0	2.87
2		7	840829	30415	11	62	26.10	3.90		48.54	4.4	0.01
3		7	841119	36166	11	47	31.30	7.70		51.60	0.2	0.22
4		7	850309	10981	11	21	20.60	5.70	157	61.07	0.0	15.80
5		7	850319	11005	11	45	27.40	5.30	203	22.54	0.0	2.50
6		7	850709	11868	11	50	25.20	4.10	152	34.48	1.0	0.03
7		7	850907	16463	11	40	25.00	6.20	168	26.72	27.8	0.15
8		7	851120	16980	11	29	30.40	8.00	226	208.70	3.6	2.64

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	CHLORIDE mg/L	DIC mg/L	DOC mg/L	HARDNESS mg/L	SUSPENDED SOLIDS mg/L	PRECIPITATION mm	DISCHARGE CMS
				MEAN:		40	26.66	5.88	181	67.86875	5.875	2.4025
				MIN:		21	20.60	3.90	152	22.54	0	-2.5
				MAX:		62	31.30	8.00	226	208.7	27.8	15.8
				STD. DEV.:		13	3.13	1.39	28.61748	56.83304	8.874648	5.303211
				n:		8	8	8	5	8	8	8
1	10	8	840406	30001	11	25	23.70	3.90		81.00	3.0	
				MEAN:		25	23.70	3.90		81	3	
				MIN:		25	23.70	3.90		81	3	
				MAX:		25	23.70	3.90		81	3	
				STD. DEV.:		0	0.00	0.00		0	0	
				n:		1	1	1	0	1	1	0
1	15	3	840418	30012	11	55	30.80	5.30		17.70	11.4	
1		3	840418	30013	14	55	30.60	5.20		16.50	11.4	
2		3	840808	30401	11	29	22.50	2.00		9.12	54.0	2.07
2		3	840808	30402	14	28	22.40	2.00		8.55	54.0	2.07
3		3	841105	36151	11	48	27.90	4.00		31.74	13.1	
4		3	850227	10961	14	30	20.20	4.70	109	63.82	2.6	9.21
4		3	850311	10983	11	34	27.00	11.00	145	37.73	0.0	
4		3	850311	10984	14	34	27.00	10.90	145	32.42	0.0	
6		3	850702	11854	11	35	22.00	2.00	101	3.38	7.2	3.01
6		3	850702	11855	14	34	21.00	1.90	98	3.41	7.2	3.01
7		3	850822	16450	11	31	19.40	1.50	98.5	5.99	0.0	2.35
7		3	850822	16451	14	31	19.40	1.60	98	6.24	0.0	2.35
8		3	851114	16964	11	36	28.40	4.50	167	26.46	4.0	5.33
8		3	851114	16965	14	36	28.40	4.40	167	29.00	4.0	5.33

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	CHLORIDE mg/L	DIC mg/L	DOC mg/L	HARDNESS mg/L	SUSPENDED SOLIDS mg/L	PRECIPITATION mm	DISCHARGE CMS
				MEAN:		37	24.79	4.36	125	20.86193	12.06429	3.858889
				MIN:		28	19.40	1.50	98	3.382	0	2.07
				MAX:		55	30.80	11.00	167	63.82	54	9.21
				STD. DEV.:		9	4.03	3.02	28.51684	16.56771	17.66415	2.244937
				n:		14	14	14	9	14	14	9
1	13	4	840419	30015	11	48	34.50	7.10		17.40	11.4	
2		4	840809	30405	11	120	29.70	6.00		80.58	54.0	
3		4	841105	36150	11	53	45.00	9.90		93.77	13.1	
4		4	850228	10964	11	26	27.20	6.00		138.30	1.0	3.82
5		4	850313	10990	11	31	34.80	5.70	156	49.30	1.8	1.45
6		4	850701	11853	11	143	30.40	3.70	207	24.42	1.2	
7		4	850823	16454	11	47	21.60	2.50	176	17.50	3.8	
8		4	851113	16963	11	28	36.00	7.80	124	100.70	8.8	1.71
				MEAN:		62	32.40	6.09	178	65.24625	11.8875	2.326667
				MIN:		26	21.60	2.50	124	17.4	1	1.45
				MAX:		143	45.00	9.90	227	138.3	54	3.82
				STD. DEV.:		41	6.49	2.16	36.45820	42.03061	16.52509	1.061268
				n:		8	8	8	5	8	8	3
1		5	840416	30011	11	61	46.00	7.10		23.20	5.4	0.17
2		5	840807	30400	11	64	33.50	10.20		37.29	25.4	0.00
3		5	841107	36156	11	87	51.50	7.20		16.32	0.0	
4		5	850302	10966	11	24	23.60	6.20	144	60.97	0.0	1.00
5		5	850314	10991	11	21	32.80	6.20	199	57.49	0.2	0.46
6		5	850704	11859	11	40	27.00	5.90	185	21.03	0.0	0.00
8		5	851115	16969	11	24	40.00	8.00	230	52.79	2.2	0.43

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	CHLORIDE mg/L	DIC mg/L	DOC mg/L	HARDNESS mg/L	SUSPENDED SOLIDS mg/L	PRECIPITATION mm	DISCHARGE CMS
				MEAN:		46	36.34	7.26	190	38.44143	4.742857	0.343833
				MIN:		21	23.60	5.90	144	16.32	0	0
				MAX:		87	51.50	10.20	230	60.97	25.4	1
				STD. DEV.:		23	9.31	1.38	30.90712	17.33044	8.633301	0.345466
				n:		7	7	7	4	7	7	6
1	15	6	840415	30010	11	79	37.50	580.00		51.30	12.4	
2		6	840810	30407	11	41	47.00	34.50		25.98	0.0	
3		6	841107	36155	11	89	57.00	62.00		78.20	0.0	
4		6	850302	10967	11	12	14.00	7.60	115	44.67	0.0	
5		6	850314	10992	11	17	22.40	7.90	172	45.11	0.2	
6		6	850704	11858	11	18	23.80	4.90	163	64.06	0.0	
8		6	851113	16962	11	14	24.80	10.80	152	243.90	8.8	
				MEAN:		38	32.36	101.10	151	79.03143	3.057143	
				MIN:		12	14.00	4.90	115	25.98	0	
				MAX:		89	57.00	580.00	172	243.9	12.4	
				STD. DEV.:		30	14.22	196.45	21.68525	68.99414	4.867049	
				n:		7	7	7	4	7	7	0
1		7	840419	30016	11	76	26.90	9.10		2.84	3.4	
2		7	840809	30404	11	58	25.10	8.00		63.91	54.0	
3		7	841106	36152	11	54	25.70	2.80		12.10	1.9	
3		7	841106	36153	14	53	25.90	3.30		12.22	1.9	
4		7	850301	10965	11	58	27.40	6.00	145	29.21	0.0	
5		7	850315	10994	11	92	25.60	12.90	145	15.75	0.2	
6		7	850703	11857	11	89	21.60	4.40	119	2.06	6.0	
7		7	850912	16472	11	48	23.40	3.30	112	11.94	5.2	
8		7	851116	16970	11	143	26.80	3.70	147	55.35	9.2	

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	CHLORIDE mg/L	DIC mg/L	DOC mg/L	HARDNESS mg/L	SUSPENDED SOLIDS mg/L	PRECIPITATION mm	DISCHARGE CMS
				MEAN:		75	25.38	5.94	134	22.82022	9.088889	
				MIN:		48	21.60	2.80	112	2.062	0	
				MAX:		143	27.40	12.90	147	63.91	54	
				STD. DEV.:		29	1.74	3.23	14.96128	21.11649	16.12117	
				n:		9	9	9	5	9	9	0

1984-1985 TRIBUTARY SURVEY
WATER-- NUTRIENTS

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMMONIUM mg/L	NITRATES mg/L	KJELDAHL mg/L	PHOSPHORUS mg/L
1	4	1	840414	30006	11	0	4.50	0.65	0.076
1		1	840414	30007	14	0	4.50	0.64	0.083
2		1	840817	30409	11	0	1.44	0.85	0.047
2		1	840817	30410	14	0	1.45	0.77	0.044
3		1	841114	36159	11	0	4.43	1.12	0.195
3		1	841114	36160	14	0	4.72	1.15	0.193
4		1	850305	10972	11	0	5.92	1.60	0.315
4		1	850305	10973	14	0	5.65	1.45	0.278
5		1	850322	10999	11	0	4.34	0.70	0.116
5		1	850322	11000	14	0	4.56	0.72	0.129
6		1	850707	11861	11	0	4.14	0.97	0.072
6		1	850707	11862	14	0	4.08	0.85	0.071
8		1	851117	16973	11		5.88		
8		1	851117	16974	14		5.98		
				MEAN:		0.111	4.40	0.96	0.134917
				MIN:		0.038	1.44	0.64	0.044
				MAX:		0.198	5.98	1.60	0.315
				STD. DEV.:		0	1.37	0.30	0.086836
				n:		12	14	12	12
1		2	840415	30009	11	0	4.25	0.67	0.067
2		2	840810	30406	11	0	1.01	0.57	0.054
3		2	841112	36158	11	0	5.22	1.35	0.168
4		2	850303	10968	11	0	3.91	1.02	0.193
5		2	850316	10996	11	0	4.60	0.90	0.151
5		2	850316	10997	14	0	4.73	0.88	0.147
6		2	850706	11860	11	0	1.08	0.59	0.057
7		2	850825	16455	11	0	0.57	0.35	0.034
7		2	850825	16456	14	0	0.57	0.40	0.036

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMMONIUM mg/L	NITRATES mg/L	KJELDAHL mg/L	PHOSPHORUS mg/L
7	4	2	850908	16466	14	0	2.97	1.04	0.12
8		2	851115	16967	11		5.88	1.52	0.325
8		2	851115	16968	14		6.20	1.33	0.295
				MEAN:		0.085	3.42	0.89	0.13725
				MIN:		0.026	0.57	0.35	0.034
				MAX:		0.138	6.20	1.52	0.325
				STD. DEV.:		0	2.02	0.37	0.093090
				n:		10	12	12	12
2		3	840827	30412	11	0	0.03	0.91	0.11
3		3	841115	36162	11	0	12.00	1.58	0.24
4		3	850306	10975	11	0	4.31	1.58	0.308
5		3	850319	11004	11	0	4.75	0.99	0.132
6		3	850707	11864	11	0	4.77	1.95	0.178
8		3	851118	16976	11				
				MEAN:		0.133	5.17	1.40	0.1936
				MIN:		0.026	0.03	0.91	0.11
				MAX:		0.254	12.00	1.95	0.308
				STD. DEV.:		0	3.85	0.39	0.072481
				n:		5	5	5	5
2		4	840828	30413	11	0	0.92	1.47	0.238
3		4	841116	36163	11	0	8.25	1.52	0.283
4		4	850308	10980	11	0	5.57	1.90	0.438
5		4	850320	11006	11	0	5.61	0.77	0.131
6		4	850708	11865	11	0	8.25	1.31	0.187
8		4	851118	16977	11		5.20		

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMMONIUM mg/L	NITRATES mg/L	KJELDAHL mg/L	PHOSPHORUS mg/L
				MEAN:		0.171	5.63	1.39	0.2554
				MIN:		0.114	0.92	0.77	0.131
				MAX:		0.248	8.25	1.90	0.438
				STD. DEV.:		0	2.45	0.37	0.104462
				n:		5	6	5	5
4	8	6	850228	10963	11	0	3.70	1.05	0.213
5		6	850313	10986	11	0	5.12	0.92	0.134
6		6	850701	11852	11	0	1.20	1.02	0.168
7		6	850823	16453	11	0	0.16	0.56	0.089
8		6	851111	16961	11		5.85	1.20	0.191
				MEAN:		0.078	3.21	0.95	0.159
				MIN:		0.028	0.16	0.56	0.089
				MAX:		0.152	5.85	1.20	0.213
				STD. DEV.:		0	2.20	0.21	0.043694
				n:		4	5	5	5
1	10	5	840408	30003	11	1	2.55	2.17	0.5
2		5	840816	30408	11	0	1.79	0.43	0.084
3		5	841116	36164	11	0	6.75	1.02	2.98
4		5	850309	10982	11	1	5.57	2.95	0.475
5		5	850320	11007	11	1	3.76	1.70	0.29
6		5	850708	11866	11	1	3.52	1.75	0.34
7		5	850908	16464	11	1	4.27	2.30	0.405
8		5	851119	16978	11				

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMMONIUM mg/L	NITRATES mg/L	KJELDAHL mg/L	PHOSPHORUS mg/L
				MEAN:		0.803	4.03	1.76	0.724857
				MIN:		0.200	1.79	0.43	0.084
				MAX:		1.460	6.75	2.95	2.98
				STD. DEV.:		0	1.58	0.77	0.929584
				n:		7	7	7	7
1	10	6	840407	30002	11	2	1.65	2.55	0.89
2		6	840828	30414	11	5	0.58	5.60	1.83
3		6	841117	36165	11	3	2.36	3.65	0.725
4		6	850306	10976	11	1	2.91	1.17	0.166
5		6	850317	11002	11	2	1.78	2.95	0.76
6		6	850709	11867	11	1	0.50	4.30	4.3
7		6	850907	16462	11	1	0.99	2.25	0.99
8		6	851119	16979	11				0.25
				MEAN:		1.953	1.54	3.21	1.238875
				MIN:		0.562	0.50	1.17	0.166
				MAX:		4.710	2.91	5.60	4.3
				STD. DEV.:		1	0.84	1.35	1.251294
				n:		7	7	7	8
1		7	840405	30000	11	0	4.25	1.15	0.168
2		7	840829	30415	11	0	0.02	0.66	0.1
3		7	841119	36166	11	0	6.53	1.52	0.203
4		7	850309	10981	11	0	4.21	1.25	0.243
5		7	850319	11005	11	0	4.05	1.01	0.157
6		7	850709	11868	11	0	0.02	1.00	0.105
7		7	850907	16463	11	0	0.03	0.66	0.074

8 7 851120 16980 11

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMMONIUM mg/L	NITRATES mg/L	KJELDAHL mg/L	PHOSPHORUS mg/L
				MEAN:		0.099	2.73	1.04	0.15
				MIN:		0.008	0.02	0.66	0.074
				MAX:		0.222	5.53	1.52	0.243
				STD. DEV.:		0	2.47	0.29	0.056229
				n:		7	7	7	7
1	10	8	840406	30001	11	0	2.15	1.32	0.128
				MEAN:		0.104	2.15	1.32	0.128
				MIN:		0.104	2.15	1.32	0.128
				MAX:		0.104	2.15	1.32	0.128
				STD. DEV.:		0	0.00	0.00	0
				n:		1	1	1	1
1	15	3	840418	30012	11	0	1.50	0.58	0.21
1		3	840418	30013	14	0	1.55	0.54	0.18
2		3	840808	30401	11	0	0.27	0.40	0.038
2		3	840808	30402	14	0	0.27	0.41	0.042
3		3	841105	36151	11	0	1.22	0.75	0.129
4		3	850227	10961	14	0	1.29	0.95	0.168
4		3	850311	10983	11	0	1.61	0.68	0.109
4		3	850311	10984	14	0	1.61	0.67	0.107
6		3	850702	11854	11	0	0.35	0.29	0.059
6		3	850702	11855	14	0	0.35	0.26	0.059
7		3	850822	16450	11	0	0.28	0.42	0.045
7		3	850822	16451	14	0	0.27	0.46	0.044

8		3	851114	16964	11			0.62	0.158
8		3	851114	16965	14			0.62	0.15

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMMONIUM mg/L	NITRATES mg/L	KJELDAHL mg/L	PHOSPHORUS mg/L
				MEAN:		0.089	0.88	0.55	0.107
				MIN:		0.022	0.27	0.26	0.038
				MAX:		0.192	1.61	0.95	0.21
				STD. DEV.:		0	0.59	0.18	0.057324
				n:		12	12	14	14
1	15	4	840419	30015	11	0	5.50	0.73	0.055
2		4	840809	30405	11	0	0.70	1.15	0.151
3		4	841105	36150	11	0	4.00	1.75	0.255
4		4	850228	10964	11	0	2.06	1.02	0.22
5		4	850313	10990	11	0	3.17	0.72	0.105
6		4	850701	11853	11	0	0.23	0.97	0.077
7		4	850823	16454	11	0	0.10	0.43	0.042
8		4	851113	16963	11			1.28	0.3
				MEAN:		0.051	2.25	1.01	0.150625
				MIN:		0.010	0.10	0.43	0.042
				MAX:		0.122	5.50	1.75	0.3
				STD. DEV.:		0	1.91	0.38	0.091150
				n:		7	7	8	8
1		5	840416	30011	11	0	1.75	0.86	0.045
2		5	840807	30400	11	0	0.26	2.32	0.275
3		5	841107	36156	11	0	5.28	0.76	0.065

4		5	850302	10966	11	0	1.69	0.97	0.132
5		5	850314	10991	11	0	2.88	0.76	0.095
6		5	850704	11859	11	0	0.30	0.69	0.085
8		5	851115	16969	11			1.02	0.135

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMMONIUM mg/L	NITRATES mg/L	KJELDAHL mg/L	PHOSPHORUS mg/L
				MEAN:		0.052	2.03	1.05	0.118857
				MIN:		0.012	0.26	0.69	0.045
				MAX:		0.098	5.28	2.32	0.275
				STD. DEV.:		0	1.71	0.53	0.070594
				n:		6	6	7	7
1	15	6	840415	30010	11	8	0.79	189.00	0.5
2		6	840810	30407	11	16	0.04	28.70	0.045
3		6	841107	36155	11	6	8.12	29.50	0.178
4		6	850302	10967	11	0	4.36	1.65	0.248
5		6	850314	10992	11	0	5.00	1.32	0.188
6		6	850704	11858	11	0	4.90	1.55	0.13
8		6	851113	16962	11			4.00	0.655
				MEAN:		5.121	3.87	36.53	0.277714
				MIN:		0.152	0.04	1.32	0.045
				MAX:		16.100	8.12	189.00	0.655
				STD. DEV.:		6	2.73	63.35	0.202345
				n:		6	6	7	7
1		7	840419	30016	11	1	0.66	1.61	0.033
2		7	840809	30404	11	2	0.82	3.90	0.097

3		7	841106	36152	11	1	0.40	1.13	0.052
3		7	841106	36153	14	1	0.40	1.36	0.049
4		7	850301	10965	11	1	0.65	2.45	0.14
5		7	850315	10994	11	2	0.56	3.50	0.095
6		7	850703	11857	11	2	0.41	2.50	0.15
7		7	850912	16472	11	0	0.35	0.63	0.071
8		7	851116	16970	11			1.52	0.11

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMMONIUM mg/L	NITRATES mg/L	KJELDAHL mg/L	PHOSPHORUS mg/L
				MEAN:		1.145	0.53	2.07	0.088556
				MIN:		0.168	0.35	0.63	0.033
				MAX:		1.850	0.82	3.90	0.15
				STD. DEV.:		1	0.16	1.04	0.038428
				n:		8	8	9	9

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WATER-METALS

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM mg/L	ARSENIC mg/L	CADMIUM mg/L	COBALT mg/L	CHROMIUM mg/L	COPPER mg/L	IRON mg/L	LEAD mg/L	MERCURY ug/L	MANGANESE mg/L	NICKEL mg/L	SELENIUM mg/L	ZINC mg/L
1	4	1	840414	30006	11		0.001	0.0002	0.002	0.004	0.007	0.960	0.003	0.01		0.004		0.006
1			840414	30007	14		0.001	0.0002	0.002	0.003	0.007	0.810	0.003	0.01		0.003		0.006
2			840817	30409	11		0.001	0.0002	0.001	0.002	0.004	0.360	0.003	0.01		0.002		0.002
2			840817	30410	14		0.001	0.0002	0.001	0.002	0.004	0.370	0.003	0.01		0.003		0.002
3			841114	36159	11		0.004	0.0002	0.003	0.006	0.008	2.400	0.004			0.006		0.012
3			841114	36160	14		0.004	0.0002	0.002	0.006	0.007	2.000	0.003	0.02		0.005		0.011
4			850305	10972	11	3.600	0.001	0.0003	0.004	0.008	0.010	4.000	0.006	0.04		0.008	0.001	0.026
4			850305	10973	14	3.700	0.001	0.0003	0.004	0.009	0.010	4.000	0.007	0.04		0.006	0.001	0.026
5			850322	10999	11									0.01				
5			850322	11000	14	0.970	0.001	0.0002	0.002	0.005	0.008	1.000	0.003	0.01	0.035	0.003	0.001	0.007
6			850707	11861	11	1.200	0.001	0.0002	0.002	0.007	0.008	1.100	0.003	0.02	0.040	0.005	0.001	0.009
6			850707	11862	14	1.100	0.001	0.0002	0.002	0.006	0.007	1.100	0.003	0.02	0.039	0.005	0.001	0.003
8			851117	16973	11	3.800	0.001	0.0003	0.005	0.005	0.007	4.800	0.003	0.02	0.071	0.008	0.001	0.027
8			851117	16974	14	3.900	0.001	0.0003	0.006	0.005	0.007	4.900	0.003	0.02	0.071	0.008	0.001	0.027
				MEAN:		2.610	0.001	0.0002	0.003	0.005	0.007	2.138	0.004	0.02	0.051	0.005	0.001	0.013
				MIN:		0.970	0.001	0.0002	0.001	0.002	0.004	0.360	0.003	0.01	0.035	0.002	0.001	0.002
				MAX:		3.900	0.004	0.0003	0.006	0.009	0.010	4.900	0.007	0.04	0.071	0.008	0.001	0.027
				STD. DEV.:		1.321	0.001	0.0000	0.001	0.002	0.002	1.632	0.001	0.01	0.016	0.002	ERROR	0.010
				n:		7	13	13	13	13	13	13	13	13	5	13	7	13
1		2	840415	30009	11		0.001	0.0002	0.002	0.004	0.007	0.870	0.003	0.01		0.004		0.007
2			840810	30406	11		0.001	0.0002	0.001	0.011	0.019	0.530	0.003	0.01		0.003		0.018
3			841112	36158	11		0.001	0.0003	0.004	0.009	0.011	3.800	0.005	0.04		0.007		0.016
4			850303	10968	11	2.700	0.001	0.0002	0.003	0.006	0.008	3.200	0.004	0.02		0.005	0.001	0.015
5			850316	10996	11	1.900	0.001	0.0002	0.002	0.007	0.009	2.100	0.003	0.01	0.031	0.005	0.001	0.013
5			850316	10997	14	1.500	0.001	0.0002	0.002	0.007	0.009	1.600	0.003	0.01	0.031	0.005	0.001	0.010
6			850706	11860	11	0.730	0.001	0.0002	0.002	0.009	0.018	0.890	0.004	0.01	0.032	0.007	0.001	0.016
7			850825	16455	11	0.140	0.001	0.0003	0.001	0.002	0.002	0.280	0.003	0.02	0.021	0.002	0.001	0.006
7			850825	16456	14	0.140	0.001	0.0003	0.001	0.018	0.003	0.270	0.003	0.02	0.022	0.002	0.001	0.007

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM mg/L	ARSENIC mg/L	CADMIUM mg/L	COBALT mg/L	CHROMIUM mg/L	COPPER mg/L	IRON mg/L	LEAD mg/L	MERCURY ug/L	MANGANESE mg/L	NICKEL mg/L	SELENIUM mg/L	ZINC mg/L
7	4	2	850908	16466	14	1.200	0.001	0.0003	0.001	0.002	0.004	1.600	0.003	0.02	0.059	0.005	0.001	0.009
8			851115	16967	11	7.200	0.001	0.0002	0.005	0.012	0.009	9.500	0.003	0.02	0.091	0.013	0.001	0.041
8			851115	16968	14	7.400	0.001	0.0002	0.001	0.009	0.013	7.200	0.003	0.01	0.076	0.015	0.001	0.036
				MEAN:		2.546	0.001	0.0002	0.002	0.008	0.009	2.653	0.003	0.02	0.045	0.006	0.001	0.016
				MIN:		0.140	0.001	0.0002	0.001	0.002	0.002	0.270	0.003	0.01	0.021	0.002	0.001	0.006
				MAX:		7.400	0.001	0.0003	0.005	0.018	0.019	9.500	0.005	0.04	0.091	0.015	0.001	0.041
				STD. DEV.:		2.655		0.0000	0.001	0.004	0.005	2.796	0.001	0.01	0.025	0.004		0.011
				n:		9	12	12	12	12	12	12	12	12	8	12	9	12
2		3	840827	30412	11		0.003	0.0002	0.001	0.004	0.002	0.900	0.003	0.01		0.003		0.005
3			841115	36162	11		0.005	0.0002	0.002	0.005	0.008	2.000	0.003	0.03		0.004		0.013
4			850306	10975	11	5.900	0.001	0.0004	0.005	0.012	0.009	6.400	0.013	0.05		0.008	0.001	0.032
5			850319	11004	11	0.600	0.001	0.0002	0.001	0.005	0.008	0.660	0.003	0.01	0.028	0.002	0.001	0.007
6			850707	11864	11	0.820	0.001	0.0002	0.002	0.006	0.009	0.890	0.004	0.01	0.057	0.004	0.001	0.008
8			851118	16976	11	6.000	0.001	0.0003	0.007	0.007	0.007	6.400	0.003	0.02	0.045	0.009	0.001	0.035
				MEAN:		3.330	0.002	0.0003	0.003	0.007	0.007	2.875	0.005	0.02	0.043	0.005	0.001	0.017
				MIN:		0.600	0.001	0.0002	0.001	0.004	0.002	0.660	0.003	0.01	0.028	0.002	0.001	0.005
				MAX:		6.000	0.005	0.0004	0.007	0.012	0.009	6.400	0.013	0.05	0.057	0.009	0.001	0.035
				STD. DEV.:		2.621	0.002	0.0001	0.002	0.003	0.002	2.529	0.004	0.01	0.012	0.003	0.000	0.012
				n:		4	6	6	6	6	6	6	6	6	3	6	4	6
2		4	840828	30413	11		0.002	0.0002	0.002	0.004	0.004	1.700	0.003	0.01		0.004		0.007
3			841116	36163	11		0.004	0.0002	0.003	0.008	0.009	4.000	0.004	0.03		0.005		0.023
4			850308	10980	11	8.900	0.001	0.0008	0.015	0.015	0.015	12.000	0.016	0.02		0.015	0.001	0.057
5			850320	11006	11	0.370	0.001	0.0002	0.001	0.005	0.007	0.380	0.003	0.01	0.018	0.002	0.001	0.006
6			850708	11865	11	3.400	0.001	0.0002	0.004	0.020	0.010	3.400	0.003	0.08	0.061	0.006	0.001	0.016
8			851118	16977	11	3.500	0.001	0.0003	0.002	0.005	0.006	4.600	0.003	0.02	0.034	0.006	0.001	0.025

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM mg/L	ARSENIC mg/L	CADMIUM mg/L	COBALT mg/L	CHROMIUM mg/L	COPPER mg/L	IRON mg/L	LEAD mg/L	MERCURY ug/L	MANGANESE mg/L	NICKEL mg/L	SELENIUM mg/L	ZINC mg/L
				MEAN:		4.043	0.002	0.0003	0.005	0.010	0.009	4.347	0.005	0.03	0.038	0.006	0.001	0.022
				MIN:		0.370	0.001	0.0002	0.001	0.004	0.004	0.380	0.003	0.01	0.018	0.002	0.001	0.006
				MAX:		8.900	0.004	0.0008	0.015	0.020	0.015	12.000	0.016	0.08	0.061	0.015	0.001	0.057
				STD. DEV.:		3.074	0.001	0.0002	0.005	0.006	0.004	3.706	0.005	0.02	0.018	0.004	0.000	0.017
				n:		4	6	6	6	6	6	6	6	6	3	6	4	6
4	8	6	850228	10963	11	2.000	0.001	0.0002	0.002	0.006	0.009	1.900	0.003	0.01		0.003	0.001	0.012
5			850313	10986	11	0.870	0.001	0.0002	0.001	0.005	0.008	0.760	0.003	0.01	0.025	0.002	0.001	0.010
6			850701	11852	11	1.400	0.001	0.0003	0.001	0.002	0.003	1.800	0.003	0.01	0.056	0.004	0.001	0.010
7			850823	16453	11	0.490	0.001	0.0003	0.001	0.002	0.003	0.920	0.003	0.01	0.056	0.002	0.001	0.012
8			851111	16961	11	1.800	0.001	0.0002	0.004	0.003	0.005	3.000	0.003	0.02	0.031	0.019	0.001	0.018
				MEAN:		1.312	0.001	0.0002	0.002	0.004	0.006	1.676	0.003	0.01	0.042	0.006	0.001	0.012
				MIN:		0.490	0.001	0.0002	0.001	0.002	0.003	0.760	0.003	0.01	0.025	0.002	0.001	0.010
				MAX:		2.000	0.001	0.0003	0.004	0.006	0.009	3.000	0.003	0.02	0.056	0.019	0.001	0.018
				STD. DEV.:		0.564		0.0000	0.001	0.002	0.002	0.804		0.00	0.014	0.007		0.003
				n:		5	5	5	5	5	5	5	5	5	4	5	5	5
1	10	5	840408	30003	11		0.001	0.0002	0.002	0.019	0.006	0.820	0.003	0.01				
2			840816	30408	11		0.001	0.0002	0.001	0.006	0.003	0.310	0.003	0.01		0.017		0.018
3			841116	36164	11		0.004	0.0002	0.001	0.081	0.008	0.530	0.016	0.03		0.016		0.010
4			850309	10982	11	2.300	0.001	0.0002	0.003	0.029	0.010	2.600	0.005	0.04		0.083		0.045
5			850320	11007	11	0.630	0.001	0.0002	0.001	0.058	0.008	0.600	0.003	0.02		0.021	0.001	0.024
6			850708	11866	11	0.570	0.001	0.0002	0.002	0.013	0.007	0.730	0.003	0.09	0.025	0.028	0.001	0.028
7			850908	16464	11	0.720	0.001	0.0003	0.001	0.034	0.005	1.300	0.003	0.04	0.030	0.036	0.001	0.028
8			851119	16978	11	5.000	0.001	0.0004	0.003	0.018	0.009	7.100	0.003	0.03	0.065	0.200	0.001	0.037

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM mg/L	ARSENIC mg/L	CADMIUM mg/L	COBALT mg/L	CHROMIUM mg/L	COPPER mg/L	IRON mg/L	LEAD mg/L	MERCURY ug/L	MANGANESE mg/L	NICKEL mg/L	SELENIUM mg/L	ZINC mg/L
				MEAN:		1.844	0.001	0.0002	0.002	0.032	0.007	1.749	0.005	0.03	0.046	0.055	0.001	0.030
				MIN:		0.570	0.001	0.0002	0.001	0.006	0.003	0.310	0.003	0.01	0.025	0.016	0.001	0.010
				MAX:		5.000	0.004	0.0004	0.003	0.081	0.010	7.100	0.016	0.09	0.065	0.200	0.001	0.052
				STD. DEV.:		1.705	0.001	0.0001	0.001	0.024	0.002	2.131	0.004	0.02	0.018	0.058		0.013
				n:		5	8	8	8	8	8	8	8	8	4	8	5	8
1	10	6	840407	30002	11		0.001	0.0030	0.010	0.016	0.010	0.220	0.030	0.01		0.036		0.170
2			840828	30414	11		0.002	0.0002	0.001	0.008	0.004	0.510	0.005	0.02		0.012		0.016
3			841117	36165	11		0.005	0.0003	0.001	0.005	0.009	0.390	0.004	0.03		0.010		0.029
4			850306	10976	11	0.290	0.001	0.0003	0.001	0.006	0.008	0.370	0.004	0.04		0.007	0.001	0.027
5			850317	11002	11	0.120	0.001	0.0005	0.001	0.006	0.010	0.190	0.005	0.01	0.064	0.007	0.001	0.034
6			850709	11867	11	0.140	0.002	0.0002	0.001	0.007	0.007	0.280	0.008	0.07	0.098	0.016	0.001	0.021
7			850907	16462	11	1.300	0.002	0.0003	0.001	0.004	0.007	2.000	0.006	0.03	0.120	0.010	0.001	0.036
8			851119	16979	11	1.100	0.001	0.0004	0.001	0.004	0.005	1.500	0.003	0.02	0.055	0.006	0.001	0.036
				MEAN:		0.590	0.002	0.0007	0.002	0.007	0.008	0.683	0.008	0.03	0.084	0.013	0.001	0.046
				MIN:		0.120	0.001	0.0002	0.001	0.004	0.004	0.190	0.003	0.01	0.055	0.006	0.001	0.016
				MAX:		1.300	0.005	0.0030	0.010	0.016	0.010	2.000	0.030	0.07	0.120	0.036	0.001	0.170
				STD. DEV.:		0.505	0.001	0.0009	0.003	0.004	0.002	0.636	0.008	0.02	0.026	0.009		0.047
				n:		5	8	8	8	8	8	8	8	8	4	8	5	8
1		7	840405	30000	11		0.001	0.0002	0.004	0.007	0.007	4.300	0.003	0.01		0.010		0.021
2			840829	30415	11		0.001	0.0002	0.001	0.004	0.002	1.500	0.003	0.01		0.003		0.006
3			841119	36166	11		0.004	0.0003	0.003	0.006	0.007	2.700	0.004	0.03		0.005		0.015
4			850309	10981	11	4.400	0.001	0.0003	0.003	0.007	0.007	4.400	0.007	0.01		0.006	0.001	0.022
5			850319	11005	11	2.000	0.001	0.0002	0.002	0.006	0.007	2.100	0.003	0.01	0.026	0.004	0.001	0.013
6			850709	11868	11	1.400	0.001	0.0002	0.002	0.006	0.005	1.400	0.003	0.01	0.040	0.003	0.001	0.008
7			850907	16463	11	1.100	0.001	0.0003	0.001	0.002	0.002	1.300	0.003	0.02	0.056	0.002	0.001	0.009
8			851120	16980	11	7.900	0.001	0.0004	0.005	0.010	0.008	9.800	0.003	0.03	0.096	0.012	0.001	0.048

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				MEAN:		3.360	0.001	0.0003	0.003	0.006	0.006	3.438	0.004	0.02	0.055	0.006	0.001	0.018
				MIN:		1.100	0.001	0.0002	0.001	0.002	0.002	1.300	0.003	0.01	0.026	0.002	0.001	0.006
				MAX:		7.900	0.004	0.0004	0.005	0.010	0.008	9.800	0.007	0.03	0.096	0.012	0.001	0.048
				STD. DEV.:		2.549	0.001	0.0001	0.001	0.002	0.002	2.668	0.001	0.01	0.026	0.003		0.013
				n:		5	8	8	8	8	8	8	8	8	4	8	5	8
1	10	8	840406	30001	11		0.001	0.0002	0.002	0.003	0.005	1.800	0.003	0.01		0.004		0.010
				MEAN:			0.001	0.0002	0.002	0.003	0.005	1.800	0.003	0.01		0.004		0.010
				MIN:			0.001	0.0002	0.002	0.003	0.005	1.800	0.003	0.01		0.004		0.010
				MAX:			0.001	0.0002	0.002	0.003	0.005	1.800	0.003	0.01		0.004		0.010
				STD. DEV.:			0.000	0.0000	0.000	0.000	0.000	0.000	0.000	0.00		0.000		0.000
				n:		0	1	1	1	1	1	1	1	1	0	1	0	1
1	15	3	840418	30012	11		0.001	0.0002	0.002	0.005	0.013	0.520	0.003	0.01		0.003		0.014
1			840418	30013	14		0.001	0.0002	0.002	0.004	0.013	0.470	0.003	0.01		0.003		0.014
2			840808	30401	11		0.001	0.0002	0.001	0.006	0.012	0.120	0.003	0.02		0.002		0.008
2			840808	30402	14		0.001	0.0002	0.001	0.007	0.012	0.140	0.003	0.01		0.002		0.009
3			841105	36151	11		0.001	0.0002	0.001	0.008	0.010	1.100	0.003	0.03		0.004		0.016
4			850227	10961	14	0.003	0.001	0.0002	0.001	0.001	0.001	0.003	0.003	0.04		0.001	0.001	0.001
4			850311	10983	11	1.200	0.001	0.0002	0.001	0.004	0.006	1.200	0.003	0.02		0.002	0.001	0.011
4			850311	10984	14	1.100	0.001	0.0002	0.001	0.004	0.006	1.100	0.003	0.02		0.002	0.001	0.010
6			850702	11854	11	0.140	0.001	0.0003	0.001	0.001	0.020	0.190	0.003	0.01	0.007	0.002	0.001	0.014
6			850702	11855	14	0.082	0.001	0.0003	0.001	0.001	0.014	0.120	0.003	0.01	0.005	0.002	0.001	0.011
7			850822	16450	11	0.067	0.001	0.0003	0.001	0.002	0.006	0.082	0.003	0.01	0.004	0.002	0.001	0.017
7			850822	16451	14	0.081	0.001	0.0003	0.001	0.002	0.007	0.084	0.003	0.01	0.004	0.002	0.001	0.019
8			851114	16964	11	1.600	0.001	0.0002	0.005	0.003	0.008	1.300	0.003	0.02	0.018	0.016	0.001	0.014
8			851114	16965	14	1.900	0.001	0.0002	0.005	0.003	0.008	1.300	0.003	0.02	0.018	0.004	0.001	0.014

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM mg/L	ARSENIC mg/L	CADMIUM mg/L	COBALT mg/L	CHROMIUM mg/L	COPPER mg/L	IRON mg/L	LEAD mg/L	MERCURY ug/L	MANGANESE mg/L	NICKEL mg/L	SELENIUM mg/L	ZINC mg/L
				MEAN:		0.686	0.001	0.0002	0.002	0.004	0.010	0.552	0.003	0.02	0.009	0.003	0.001	0.012
				MIN:		0.003	0.001	0.0002	0.001	0.001	0.001	0.003	0.003	0.01	0.004	0.001	0.001	0.001
				MAX:		1.900	0.001	0.0003	0.005	0.008	0.020	1.300	0.003	0.04	0.018	0.016	0.001	0.019
				STD. DEV.:		0.717		0.0000	0.001	0.002	0.005	0.504		0.01	0.006	0.004		0.004
				n:		9	14	14	14	14	14	14	14	14	6	14	9	14
1	15	4	840419	30015	11		0.001	0.0002	0.002	0.004	0.007	0.620	0.003	0.01		0.003		0.010
2			840809	30405	11		0.001	0.0002	0.002	0.005	0.004	2.100	0.003	0.06		0.003		0.016
3			841105	36150	11		0.001	0.0003	0.004	0.009	0.012	3.700	0.006	0.06		0.007		0.028
4			850228	10964	11	2.800	0.001	0.0002	0.003	0.007	0.009	3.300	0.005			0.005	0.001	0.021
5			850313	10990	11	0.850	0.001	0.0002	0.001	0.005	0.006	0.770	0.003	0.02	0.022	0.002	0.001	0.010
6			850701	11853	11	0.250	0.001	0.0003	0.001	0.001	0.003	0.480	0.003	0.01	0.037	0.002	0.001	0.006
7			850823	16454	11	0.130	0.001	0.0003	0.001	0.001	0.003	0.230	0.003	0.02	0.030	0.002	0.001	0.006
8			851113	16963	11	6.800	0.001	0.0002	0.003	0.007	0.009	5.300	0.003	0.04	0.058	0.008	0.001	0.035
				MEAN:		2.166	0.001	0.0002	0.002	0.005	0.007	2.063	0.004	0.03	0.037	0.004	0.001	0.017
				MIN:		0.130	0.001	0.0002	0.001	0.001	0.003	0.230	0.003	0.01	0.022	0.002	0.001	0.006
				MAX:		6.800	0.001	0.0003	0.004	0.009	0.012	5.300	0.006	0.06	0.058	0.008	0.001	0.035
				STD. DEV.:		2.507	0.000	0.0000	0.001	0.003	0.003	1.743	0.001	0.02	0.013	0.002		0.010
				n:		5	8	8	8	8	8	8	8	7	4	8	5	8
1		5	840416	30011	11		0.001	0.0002	0.002	0.004	0.006	0.750	0.003	0.01		0.003		0.010
2			840807	30400	11		0.002	0.0002	0.002	0.005	0.007	0.810	0.004	0.03		0.004		0.021
3			841107	36156	11		0.001	0.0002	0.001	0.006	0.008	0.570	0.003	0.02		0.002		0.009
4			850302	10966	11	1.900	0.001	0.0002	0.002	0.006	0.008	2.100	0.003	0.01		0.004	0.001	0.020
5			850314	10991	11	1.000	0.001	0.0002	0.001	0.005	0.007	1.100	0.003	0.01	0.025	0.003	0.001	0.015
6			850704	11859	11	0.960	0.002	0.0003	0.001	0.001	0.002	1.100	0.003	0.03	0.038	0.003	0.001	0.010
8			851115	16969	11	3.300	0.001	0.0002	0.001	0.003	0.006	2.600	0.003	0.02	0.037	0.009	0.001	0.023

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM mg/L	ARSENIC mg/L	CADMIUM mg/L	COBALT mg/L	CHROMIUM mg/L	COPPER mg/L	IRON mg/L	LEAD mg/L	MERCURY ug/L	MANGANESE mg/L	NICKEL mg/L	SELENIUM mg/L	ZINC mg/L
				MEAN:		1.790	0.001	0.0002	0.001	0.004	0.006	1.290	0.003	0.02	0.033	0.004	0.001	0.015
				MIN:		0.960	0.001	0.0002	0.001	0.001	0.002	0.570	0.003	0.01	0.025	0.002	0.001	0.009
				MAX:		3.300	0.002	0.0003	0.002	0.006	0.008	2.600	0.004	0.03	0.038	0.009	0.001	0.023
				STD. DEV.:		0.949	0.000	0.0000	0.000	0.002	0.002	0.706	0.000	0.01	0.006	0.002	0.000	0.005
				n:		4	7	7	7	7	7	7	7	7	3	7	4	7
1	15	6	840415	30010	11		0.001	0.0002	0.003	0.150	0.011	1.700	0.003	0.07				
2			840810	30407	11		0.001	0.0002	0.001	0.006	0.002	0.540	0.003	0.01		0.010		0.020
3			841107	36155	11		0.001	0.0003	0.003	0.010	0.010	1.700	0.003	0.03		0.002		0.004
4			850302	10967	11	3.100	0.001	0.0002	0.003	0.006	0.007	3.100	0.004	0.02		0.006		0.018
5			850314	10992	11	1.300	0.001	0.0002	0.002	0.004	0.007	1.300	0.003	0.01		0.005	0.001	0.016
6			850704	11858	11	2.600	0.001	0.0003	0.001	0.006	0.004	3.100	0.003	0.01	0.017	0.003	0.001	0.009
8			851113	16962	11	7.200	0.001	0.0002	0.005	0.019	0.006	11.800	0.004	0.03	0.051	0.007	0.001	0.017
															0.076	0.018	0.001	0.048
				MEAN:		3.550	0.001	0.0002	0.003	0.029	0.007	3.320	0.003	0.03	0.048	0.007	0.001	0.019
				MIN:		1.300	0.001	0.0002	0.001	0.004	0.002	0.540	0.003	0.01	0.017	0.002	0.001	0.004
				MAX:		7.200	0.001	0.0003	0.005	0.150	0.011	11.800	0.004	0.07	0.076	0.018	0.001	0.048
				STD. DEV.:		2.207	ERROR	0.0000	0.001	0.050	0.003	3.567	0.000	0.02	0.024	0.005	0.000	0.013
				n:		4	7	7	7	7	7	7	7	7	3	7	4	7
1		7	840419	30016	11		0.001	0.0002	0.002	0.002	0.006	0.140	0.003	0.02				
2			840809	30404	11		0.001	0.0003	0.001	0.004	0.007	1.200	0.003	0.03		0.005		0.010
3			841106	36152	11		0.001	0.0002	0.001	0.003	0.008	0.280	0.003	0.02		0.007		0.026
3			841106	36153	14		0.001	0.0002	0.001	0.003	0.006	0.260	0.003	0.02		0.003		0.008
4			850301	10965	11	0.590	0.001	0.0002	0.001	0.004	0.079	0.460	0.003	0.02		0.003		0.008
5			850315	10994	11	0.290	0.001	0.0002	0.001	0.004	0.030	0.140	0.003	0.01		0.004	0.001	0.013
6			850703	11857	11	0.460	0.001	0.0020	0.001	0.002	0.004	0.150	0.003	0.01	0.013	0.006	0.001	0.012
7			850912	16472	11	0.290	0.001	0.0005	0.001	0.002	0.003	0.310	0.003	0.03	0.006	0.003	0.001	0.010
8			851116	16970	11	1.300	0.001	0.0002	0.001	0.003	0.007	1.200	0.003	0.05	0.010	0.005	0.001	0.010
															0.032	0.010	0.001	0.040

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM mg/L	ARSENIC mg/L	CADMIUM mg/L	COBALT mg/L	CHROMIUM mg/L	COPPER mg/L	IRON mg/L	LEAD mg/L	MERCURY ug/L	MANGANESE mg/L	NICKEL mg/L	SELENIUM mg/L	ZINC mg/L
				MEAN:		0.586	0.001	0.0004	0.001	0.003	0.017	0.460	0.003	0.02	0.015	0.005	0.001	0.015
				MIN:		0.290	0.001	0.0002	0.001	0.002	0.003	0.140	0.003	0.01	0.006	0.003	0.001	0.008
				MAX:		1.300	0.001	0.0020	0.002	0.004	0.079	1.200	0.003	0.05	0.032	0.010	0.001	0.040
				STD. DEV.:		0.374	ERROR	0.0006	0.000	0.001	0.023	0.407	0.000	0.01	0.010	0.002	[illegible]	0.010
				n:		5	9	9	9	9	9	9	9	9	4	9	5	9

1984-1985 TRIBUTARY SURVEY
WATER--PESTICIDES

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/L	a-BHC ng/L	b-BHC ng/L	ATRAZINE ng/L	METHOXYCHLOR ng/L	ENDRIN ng/L	PP-DDE ng/L	ENDOSULPHAN I ng/L	ENDOSULPHAN II ng/L	HEPTACHLOR EPOXIDE ng/L	GAMMA BHC ng/L
1	4	1	840414	30006	11	0	0	0		0	0	0	0	0	0	0
1		1	840414	30007	14	0	0	0		0	0	0	0	0	0	0
2		1	840817	30409	11	0	3	0		0	0	0	0	0	0	3
2		1	840817	30410	14	0	2	0		0	0	0	0	0	0	3
3		1	841114	36159	11	0	2	0		0	0	0	0	0	0	2
3		1	841114	36160	14	0	2	0		0	0	0	0	0	0	2
4		1	850305	10972	11	0	2	0	0	0	0	0	0	0	0	0
4		1	850305	10973	14	0	2	0	0	0	0	2	0	0	0	0
5		1	850322	10999	11	0	0	0	0	0	0	0	0	0	0	0
5		1	850322	11000	14	0	0	0	0	0	0	0	0	0	0	0
6		1	850707	11861	11	0	0	0	0	0	0	0	0	0	0	0
6		1	850707	11862	14	0	0	0	0	0	0	0	0	0	0	0
8		1	851117	16973	11	0	0	0	390	0	0	0	0	0	2	0
8		1	851117	16974	14	0	0	0	390	0	0	0	0	0	2	0
				MEAN:		0.0	0.9	0.0	97.5	0.0	0.0	0.1	0.0	0.0	0.3	0.7
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	3.0	0.0	390.0	0.0	0.0	2.0	0.0	0.0	2.0	3.0
				STD. DEV.:		0.0	1.1	0.0	168.9	0.0	0.0	0.5	0.0	0.0	0.7	1.2
				n:		14	14	14	8	14	14	14	14	14	14	14
1		2	840415	30009	11	0	0	0		0	0	0	0	0	0	0
2		2	840810	30406	11	0	5	0		0	0	0	0	0	0	0
3		2	841112	36158	11	0	2	0		0	0	0	0	0	0	0
4		2	850303	10968	11	0	0	0	440	0	0	0	0	0	0	0
5		2	850316	10996	11	0	0	0	0	0	0	0	0	0	0	0
5		2	850316	10997	14	0	0	0	0	0	0	0	0	0	0	0
6		2	850706	11860	11	0	0	0	0	0	0	0	0	0	0	0
7		2	850825	16455	11	0	0	0		0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/L	a-BHC ng/L	b-BHC ng/L	ATRAZINE ng/L	METHOXYCHLOR ng/L	ENDRIN ng/L	PP-DDE ng/L	ENDOSULPHAN I ng/L	ENDOSULPHAN II ng/L	HEPTACHLOR EPOXIDE ng/L	GAMMA BHC ng/L
7	4	2	850825	16456	14	0	0	0		0	0	0	0	0	0	0
7		2	850908	16466	14	0	0	0	0	0	0	0	0	0	0	3
8		2	851115	16967	11	0	2	0	720	0	0	0	0	0	0	0
8		2	851115	16968	14	0	0	0	860	0	0	0	0	0	0	0
				MEAN:		0.0	0.8	0.0	288.6	0.0	0.0	0.0	0.0	0.0	0.0	0.3
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	5.0	0.0	860.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
				STD. DEV.:		0.0	1.5	0.0	352.3	0.0	0.0	0.0	0.0	0.0	0.0	0.8
				n:		12	12	12	7	12	12	12	12	12	12	12
2		3	840827	30412	11	0	3	0		0	0	0	0	0	0	0
3		3	841115	36162	11	0	2	0		0	0	1	0	0	0	0
4		3	850306	10975	11	0	3	0	0	0	0	0	0	0	0	0
5		3	850319	11004	11	0	0	0	0	0	0	0	0	0	0	0
6		3	850707	11864	11	0	4	0	0	0	0	0	0	0	0	3
8		3	851118	16976	11	0	1	0	450	0	0	0	0	0	2	0
				MEAN:		0.0	2.2	0.0	112.5	0.0	0.0	0.2	0.0	0.0	0.3	0.5
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	4.0	0.0	450.0	0.0	0.0	1.0	0.0	0.0	2.0	3.0
				STD. DEV.:		0.0	1.3	0.0	194.9	0.0	0.0	0.4	0.0	0.0	0.7	1.1
				n:		6	6	6	4	6	6	6	6	6	6	6
2		4	840828	30413	11	0	0	0		0	0	0	0	0	0	0
3		4	841116	36163	11	0	2	0		0	0	2	0	0	0	0
4		4	850308	10980	11	0	2	0	0	0	0	4	0	0	0	0
5		4	850320	11006	11	0	0	0	0	0	0	0	0	0	0	0
6		4	850708	11865	11				3000							
8		4	851118	16977	11	0	0	0	140	0	0	0	0	0	2	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/L	a-BHC ng/L	b-BHC ng/L	ATRAZINE ng/L	METHOXYCHLOR ng/L	ENDRIN ng/L	PP-DDE ng/L	ENDOSULPHAN I ng/L	ENDOSULPHAN II ng/L	HEPTACHLOR EPOXIDE ng/L	GAMMA BHC ng/L
				MEAN:		0.0	0.8	0.0	785.0	0.0	0.0	1.2	0.0	0.0	0.4	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	2.0	0.0	3000.0	0.0	0.0	4.0	0.0	0.0	2.0	0.0
				STD. DEV.:		0.0	1.0	0.0	1280.1	0.0	0.0	1.6	0.0	0.0	0.8	0.0
				n:		5	5	5	4	5	5	5	5	5	5	5
4	8	6	850228	10963	11	0	0	0	120	0	-0	0	0	0	0	0
5		6	850313	10986	11	0	0	0	0	0	0	0	0	0	0	4
6		6	850701	11852	11	0	0	0	500	0	0	0	0	0	0	0
7		6	850823	16453	11	0	0	0		0	0	0	0	0	0	0
8		6	851111	16961	11	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0.0	0.0	0.0	155.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0	500.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
				STD. DEV.:		0.0	0.0	0.0	205.1	0.0	0.0	0.0	0.0	0.0	0.0	1.6
				n:		5	5	5	4	5	5	5	5	5	5	5
1	10	5	840408	30003	11	0	4	0		0	0	0	0	0	0	8
2		5	840816	30408	11	0	4	0		0	0	0	0	0	0	6
3		5	841116	36164	11	0	4	0		0	0	0	0	0	0	20
4		5	850309	10982	11	0	1	0	0	0	0	2	0	0	0	7
5		5	850320	11007	11	0	2	0	0	0	0	0	0	0	0	16
6		5	850708	11866	11	0	5	0	0	0	0	0	0	0	0	14
7		5	850908	16464	11	0	4	0	0	0	0	0	0	0	0	25
8		5	851119	16978	11	0	2	0	0	0	0	0	0	0	0	9

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/L	a-BHC ng/L	b-BHC ng/L	ATRAZINE ng/L	METHOXYCHLOR ng/L	ENDRIN ng/L	PP-DDE ng/L	ENDOSULPHAN I ng/L	ENDOSULPHAN II ng/L	HEPTACHLOR EPOXIDE ng/L	GAMMA BHC ng/L
				MEAN:		0.0	3.3	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	13.1
				MIN:		0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
				MAX:		0.0	5.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	25.0
				STD. DEV.:		0.0	1.3	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	6.4
				n:		8	8	8	5	8	8	8	8	8	8	8
1	10	6	840407	30002	11	0	0	0		0	0	0	0	0	0	4
2		6	840828	30414	11	0	0	0		0	0	0	0	0	0	0
3		6	841117	36165	11	0	2	0		0	0	0	0	0	0	6
4		6	850306	10976	11	0	2	0	0	0	0	0	0	0	0	0
5		6	850317	11002	11	0	1	0	0	0	0	0	0	0	0	9
6		6	850709	11867	11	0	0	0	0	0	0	0	0	0	0	0
7		6	850907	16462	11	0	0	0	0	0	0	0	20	14	0	9
8		6	851119	16979	11	0	1	0	0	0	0	0	0	0	0	0
				MEAN:		0.0	0.8	0.0	0.0	0.0	0.0	0.0	2.5	1.8	0.0	3.5
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	2.0	0.0	0.0	0.0	0.0	0.0	20.0	14.0	0.0	9.0
				STD. DEV.:		0.0	0.8	0.0	0.0	0.0	0.0	0.0	6.6	4.6	0.0	3.8
				n:		8	8	8	5	8	8	8	8	8	8	8
1		7	840405	30000	11	0	0	0		0	0	0	0	0	0	0
2		7	840829	30415	11	0	0	0		0	0	0	0	0	0	0
3		7	841119	36166	11	0	6	0		0	0	0	0	0	0	0
4		7	850309	10981	11	0	0	0	0	0	0	2	0	0	0	2
5		7	850319	11005	11	0	1	0	0	0	0	0	0	0	0	0
6		7	850709	11868	11	0	0	0	0	0	0	0	0	0	0	0
7		7	850907	16463	11	0	0	0	0	0	0	0	0	0	0	0
		7	851120	16980	11	0	2	0	100	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/L	a-BHC ng/L	b-BHC ng/L	ATRAZINE ng/L	METHOXYCHLOR ng/L	ENDRIN ng/L	PP-DDE ng/L	ENDOSULPHAN I ng/L	ENDOSULPHAN II ng/L	HEPTACHLOR EPOXIDE ng/L	GAMMA BHC ng/L
				MEAN:		0.0	1.1	0.0	20.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	6.0	0.0	100.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0
				STD. DEV.:		0.0	2.0	0.0	40.0	0.0	0.0	0.7	0.0	0.0	0.0	0.7
				n:		8	8	8	5	8	8	8	8	8	8	8
1	10	8	840406	30001	11	0	0	0		0	0	0	0	0	0	0
				MEAN:		0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
				n:		1	1	1	0	1	1	1	1	1	1	1
1	15	3	840418	30012	11	0	4	0		0	0	0	0	0	0	0
1		3	840418	30013	14	0	3	0		0	0	0	0	0	0	0
2		3	840808	30401	11	0	4	0		0	0	0	0	0	0	0
2		3	840808	30402	14	0	5	0		0	0	0	0	0	0	0
3		3	841105	36151	11	0	3	0		0	0	0	0	0	0	0
4		3	850227	10961	14	0	3	0	230	0	0	0	0	0	0	0
4		3	850311	10983	11	0	2	0	310	0	0	0	0	0	0	0
4		3	850311	10984	14	0	0	0	370	0	0	0	0	0	0	0
6		3	850702	11854	11	0	5	0	140	0	0	0	0	0	0	0
6		3	850702	11855	14	0	4	0	260	0	0	0	0	0	0	2
7		3	850822	16450	11	0	0	0	0	0	0	0	0	0	0	2
7		3	850822	16451	14	0	0	0	0	0	0	0	0	0	0	0
8		3	851114	16964	11	0	2	0	510	0	0	0	0	0	0	0
8		3	851114	16965	14	0	2	0	330	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/L	a-BHC ng/L	b-BHC ng/L	ATRAZINE ng/L	METHOXYCHLOR ng/L	ENDRIN ng/L	PP-DDE ng/L	ENDOSULPHAN I ng/L	ENDOSULPHAN II ng/L	HEPTACHLOR EPOXIDE ng/L	GAMMA BHC ng/L
				MEAN:		0.0	2.6	0.0	238.9	0.0	0.0	0.0	0.0	0.0	0.0	0.3
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	5.0	0.0	510.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
				STD. DEV.:		0.0	1.7	0.0	159.3	0.0	0.0	0.0	0.0	0.0	0.0	0.7
				n:		14	14	14	9	14	14	14	14	14	14	14
1	15	4	840419	30015	11	0	0	0		0	0	0	0	0	0	0
2		4	840809	30405	11	0	4	0		0	0	0	0	0	0	0
3		4	841105	36150	11	0	2	0		0	0	0	0	0	0	0
4		4	850228	10964	11	0	1	0	650	0	0	0	0	0	0	0
5		4	850313	10990	11	0	0	0	50	0	0	0	0	0	0	0
6		4	850701	11853	11	0	0	0	8450	0	0	0	0	0	0	0
7		4	850823	16454	11	0	0	0		0	0	0	0	0	0	0
8		4	851113	16963	11	0	2	0	900	0	0	0	0	0	0	1
				MEAN:		0.0	1.1	0.0	2512.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1
				MIN:		0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	4.0	0.0	8450.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
				STD. DEV.:		0.0	1.4	0.0	3441.9	0.0	0.0	0.0	0.0	0.0	0.0	0.3
				n:		8	8	8	4	8	8	8	8	8	8	8
1		5	840416	30011	11	0	0	0		0	0	0	0	0	0	0
2		5	840807	30400	11	0	4	0		0	0	0	0	0	0	0
3		5	841107	36156	11	0	2	0		0	0	0	0	0	0	0
4		5	850302	10966	11	0	0	0	650	0	0	0	0	0	0	0
5		5	850314	10991	11	0	0	0	50	0	0	0	0	0	0	0
6		5	850704	11859	11				1040							
8		5	851115	16969	11	0	0	0	2840	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/L	a-BHC ng/L	b-BHC ng/L	ATRAZINE ng/L	METHOXYCHLOR ng/L	ENDRIN ng/L	PP-DDE ng/L	ENDOSULPHAN I ng/L	ENDOSULPHAN II ng/L	HEPTACHLOR EPOXIDE ng/L	GAMMA BHC ng/L
				MEAN:		0.0	1.0	0.0	1145.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	4.0	0.0	2840.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				STD. DEV.:		0.0	1.5	0.0	1040.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				n:		6	6	6	4	6	6	6	6	6	6	6
1	15	6	840415	30010	11	0	4	0				0				0
2		6	840810	30407	11	0	4	0		0	0	0	0	0	0	0
3		6	841107	36155	11	0	2	0		0	0	0	0	0	0	0
4		6	850302	10967	11	0	2	0	140	0	0	0	0	0	0	0
5		6	850314	10992	11	0	0	0	0	0	0	0	0	0	0	0
6		6	850704	11858	11	0	6	0	3700	0	0	0	0	0	0	3
8		6	851113	16962	11	0	2	0	120	0	0	0	0	0	0	0
				MEAN:		0.0	2.9	0.0	990.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	6.0	0.0	3700.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
				STD. DEV.:		0.0	1.8	0.0	1565.5	0.0	0.0	0.0	0.0	0.0	0.0	1.0
				n:		7	7	7	4	6	6	7	6	6	6	7
1		7	840419	30016	11	0	0	0		0	0	0	0	0	0	0
2		7	840809	30404	11	0	0	0		0	0	0	0	0	0	0
3		7	841106	36152	11	0	10	0		0	0	0	0	0	0	0
3		7	841106	36153	14	0	10	0		0	0	0	0	0	0	0
4		7	850301	10965	11	0	1	0	170	0	0	0	0	0	0	0
5		7	850315	10994	11	0	0	0	0	0	0	0	0	0	0	4
6		7	850703	11857	11	0	3	0	430	0	0	0	0	0	0	0
7		7	850912	16472	11	0	0	0	0	0	0	0	0	0	0	0
8		7	851116	16970	11	0	4	0	390	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/L	a-BHC ng/L	b-BHC ng/L	ATRAZINE ng/L	METHOXYCHLOR ng/L	ENDRIN ng/L	PP-DDE ng/L	ENDOSULPHAN I ng/L	ENDOSULPHAN II ng/L	HEPTACHLOR EPOXIDE ng/L	GAMMA BHC ng/L
				MEAN:		0.0	3.1	0.0	198.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	10.0	0.0	430.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
				STD. DEV.:		0.0	3.9	0.0	184.3	0.0	0.0	0.0	0.0	0.0	0.0	1.3
				n:		9	9	9	5	9	9	9	9	9	9	9

1984-1985 TRIBUTARY SURVEY
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SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	PHENOLS ug/L	PCBs ng/L	HCBD ng/L	HCB ng/L	HCE ng/L	OCS ng/L
1	4	1	840414	30006	11	0.0	0	0	0	0	0
1			840414	30007	14	0.0	0	0	0	0	0
2			840817	30409	11	0.0	0	0	0	0	0
2			840817	30410	14	0.0	0	0	0	0	0
3			841114	36159	11	0.6	0	0	0	0	0
3			841114	36160	14	27.6	0	0	0	0	0
4			850305	10972	11	0.8	0	0	0	1	0
4			850305	10973	14	1.0	0	0	0	0	0
5			850322	10999	11	0.6	0	0	0	0	0
5			850322	11000	14		0	0	0	0	0
6			850707	11861	11	2.4	0	0	0	0	0
6			850707	11862	14	5.0	0	0	0	0	0
8			851117	16973	11	1.2	0	0	0	0	0
8			851117	16974	14	1.6	0	0	0	0	0
				MEAN:		3.1	0.0	0.0	0.0	0.1	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		27.6	0.0	0.0	0.0	1.0	0.0
				STD. DEV.:		7.2	0.0	0.0	0.0	0.3	0.0
				n:		13	14	14	14	14	14
1		2	840415	30009	11	0.0	0	0	0	0	0
2			840810	30406	11	0.0	0		0	3	0
3			841112	36158	11	1.0	0	0	0	0	0
4			850303	10968	11	0.4	0	0	0	0	0
5			850316	10996	11	1.6	0	0	0	0	0
5			850316	10997	14	2.0	0	0	0	0	0
6			850706	11860	11	6.6	0	0	0	0	0
7			850825	16455	11		0	6	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	PHENOLS ug/L	PCBs ng/L	HCBD ng/L	HCB ng/L	HCE ng/L	OCS ng/L
7	4	2	850825	16456	14		0	5	0	0	0
7			850908	16466	14		0	0	0	0	0
8			851115	16967	11	9.4	0	3	4	0	0
8			851115	16968	14	6.0	0	0	0	0	0
				MEAN:		3.0	0.0	1.3	0.3	0.3	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		9.4	0.0	6.0	4.0	3.0	0.0
				STD. DEV.:		3.2	0.0	2.2	1.1	0.8	0.0
				n:		9	12	11	12	12	12
2		3	840827	30412	11	0.0	0	2	0	0	0
3			841115	36162	11	1.6	0	0	0	0	0
4			850306	10975	11	1.4	0	0	0	0	0
5			850319	11004	11	0.8	0	0	0	0	0
6			850707	11864	11	2.8	0	0	0	0	0
8			851118	16976	11	12.0	0	2	0	0	0
				MEAN:		3.1	0.0	0.7	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		12.0	0.0	2.0	0.0	0.0	0.0
				STD. DEV.:		4.1	0.0	0.9	0.0	0.0	0.0
				n:		6	6	6	6	6	6
2		4	840828	30413	11	0.2	0	0	0	0	0
3			841116	36163	11	1.2	0	0	0	0	0
4			850308	10980	11		0	0	0	0	0
5			850320	11006	11	2.0	0	0	0	0	0
6			850708	11865	11	3.2					
8			851118	16977	11	4.4	0	2	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	PHENOLS ug/L	PCBs ng/L	HCBD ng/L	HCB ng/L	HCE ng/L	OCS ng/L
				MEAN:		2.2	0.0	0.4	0.0	0.0	0.0
				MIN:		0.2	0.0	0.0	0.0	0.0	0.0
				MAX:		4.4	0.0	2.0	0.0	0.0	0.0
				STD. DEV.:		1.5	0.0	0.8	0.0	0.0	0.0
				n:		5	5	5	5	5	5
4	8	6	850228	10963	11	1.8	0	0	0	0	0
5			850313	10986	11	1.2	0		0		
6			850701	11852	11	0.0	0	0	0	0	0
7			850823	16453	11		0	0	0	0	0
8			851111	16961	11	5.2	0	0	10	0	0
				MEAN:		2.1	0.0	0.0	2.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		5.2	0.0	0.0	10.0	0.0	0.0
				STD. DEV.:		1.9	0.0	0.0	4.0	0.0	0.0
				n:		4	5	4	5	4	4
1	10	5	840408	30003	11	0.0	0	0	0	0	0
2			840816	30408	11	0.0	0	0	0	0	0
3			841116	36164	11	5.8	0	0	0	3	0
4			850309	10982	11	4.0	0	1	0	0	0
5			850320	11007	11	3.0	0	0	0	0	0
6			850708	11866	11	3.4	0	0	0	0	0
7			850908	16464	11		0	0	3	0	0
8			851119	16978	11	4.0	0	0	3	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	PHENOLS ug/L	PCBs ng/L	HCBD ng/L	HCB ng/L	HCE ng/L	OCS ng/L
				MEAN:		2.9	0.0	0.1	0.8	0.4	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		5.8	0.0	1.0	3.0	3.0	0.0
				STD. DEV.:		2.0	0.0	0.3	1.3	1.0	0.0
				n:		7	8	8	8	8	8
1	10	6	840407	30002	11	6.0	0	0	0	0	0
2			840828	30414	11	0.8	0	0	0	0	0
3			841117	36165	11	1.4	0	0	0	0	0
4			850306	10976	11	1.6	0	0	0	0	0
5			850317	11002	11	1.8	0	0	0	0	0
6			850709	11867	11	4.2	0	0	0	0	0
7			850907	16462	11		0	0	2	0	0
8			851119	16979	11	2.6	0	0	2	0	0
				MEAN:		2.6	0.0	0.0	0.5	0.0	0.0
				MIN:		0.8	0.0	0.0	0.0	0.0	0.0
				MAX:		6.0	0.0	0.0	2.0	0.0	0.0
				STD. DEV.:		1.7	0.0	0.0	0.9	0.0	0.0
				n:		7	8	8	8	8	8
1		7	840405	30000	11	0.0	0	0	0	0	0
2			840829	30415	11	0.0	0	0	0	0	0
3			841119	36166	11	1.6	0	0	0	15	0
4			850309	10981	11	1.6	0	1	0	0	0
5			850319	11005	11	1.8	0	0	0	0	0
6			850709	11868	11	2.2	0	0	0	0	0
7			850907	16463	11		0	0	3	0	0
8			851120	16980	11	5.2	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	PHENOLS ug/L	PCBs ng/L	HCBD ng/L	HCB ng/L	HCE ng/L	OCS ng/L
				MEAN:		1.8	0.0	0.1	0.4	1.9	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		5.2	0.0	1.0	3.0	15.0	0.0
				STD. DEV.:		1.6	0.0	0.3	1.0	5.0	0.0
				n:		7	8	8	8	8	8
1	10	8	840406	30001	11	0.0	0	0	0	0	0
				MEAN:		0.0	0.0	0.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0	0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0	0.0	0.0	0.0
				n:		1	1	1	1	1	1
1	15	3	840418	30012	11	7.8	0		16	0	0
1			840418	30013	14	15.0	0		9	0	0
2			840808	30401	11	1.2	0		7	45	0
2			840808	30402	14	1.2	0		8	50	0
3			841105	36151	11	3.8	0	8	3	5	0
4			850227	10961	14	2.8	0	0	0	2	0
4			850311	10983	11	2.2	0	0	0	0	11
4			850311	10984	14	1.8	0	0	0	0	0
6			850702	11854	11	4.6	0	0	18	0	0
6			850702	11855	14	5.6	0	0	15	0	0
7			850822	16450	11		0	11	14	15	0
7			850822	16451	14		0	4	12	2	0
8			851114	16964	11	3.2	0	0	4	0	0
8			851114	16965	14	3.4	0	0	5	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	PHENOLS ug/L	PCBs ng/L	HCBD ng/L	HCB ng/L	HCE ng/L	OCS ng/L
				MEAN:		4.4	0.0	2.3	7.9	8.5	0.8
				MIN:		1.2	0.0	0.0	0.0	0.0	0.0
				MAX:		15.0	0.0	11.0	18.0	50.0	11.0
				STD. DEV.:		3.7	0.0	3.8	6.0	16.4	2.8
				n:		12	14	10	14	14	14
1	15	4	840419	30015	11	0.0	0	5	0	0	0
2			840809	30405	11	1.4	0	50	0	2	0
3			841105	36150	11	3.2	0	0	0	0	0
4			850228	10964	11	1.0	0	0	0	0	0
5			850313	10990	11	1.2	0	0	0	0	0
6			850701	11853	11	0.0	0	0	0	0	0
7			850823	16454	11		0	0	4	0	0
8			851113	16963	11	1.6	0	0	4	0	0
				MEAN:		1.2	0.0	6.9	1.0	0.3	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		3.2	0.0	50.0	4.0	2.0	0.0
				STD. DEV.:		1.0	0.0	16.4	1.7	0.7	0.0
				n:		7	8	8	8	8	8
1		5	840416	30011	11	0.0	0	8	0	0	0
2			840807	30400	11	0.0	0	3	0	0	0
3			841107	36156	11	1.2	0	0	0	0	0
4			850302	10966	11	1.6	0	0	0	0	0
5			850314	10991	11	1.6	0	0	0	0	0
6			850704	11859	11	0.6					
8			851115	16969	11	4.4	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	PHENOLS ug/L	PCBs ng/L	HCBD ng/L	HCB ng/L	HCE ng/L	OCS ng/L
				MEAN:		1.3	0.0	1.8	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		4.4	0.0	8.0	0.0	0.0	0.0
				STD. DEV.:		1.4	0.0	3.0	0.0	0.0	0.0
				n:		7	6	6	6	6	6
1	15	6	840415	30010	11	2.4	0	8	2	0	0
2			840810	30407	11	0.0	0	30	0	6	0
3			841107	36155	11	1.4	0	0	0	0	0
4			850302	10967	11	0.8	0	0	0	0	0
5			850314	10992	11	0.8	0		0		
6			850704	11858	11	2.0	0	0	0	0	0
8			851113	16962	11	7.4	0	1	0	0	0
				MEAN:		2.1	0.0	6.5	0.3	1.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		7.4	0.0	30.0	2.0	6.0	0.0
				STD. DEV.:		2.3	0.0	10.9	0.7	2.2	0.0
				n:		7	7	6	7	6	6
1		7	840419	30016	11	7.0	0	30	60	5	60
2			840809	30404	11	4.8	0	0	210	550	160
3			841106	36152	11	10.6	0	0	13	0	0
3			841106	36153	14	10.2	0	30	12	0	0
4			850301	10965	11	4.2	0	0	0	0	0
5			850315	10994	11	122.0	0		25		
6			850703	11857	11	10.2	0	345	11	0	0
7			850912	16472	11		0		80		
8			851116	16970	11	14.0	0	250	145	130	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	PHENOLS ug/L	PCBs ng/L	HCBD ng/L	HCB ng/L	HCE ng/L	OCS ng/L
				MEAN:		22.9	0.0	93.6	61.8	97.9	31.4
				MIN:		4.2	0.0	0.0	0.0	0.0	0.0
				MAX:		122.0	0.0	345.0	210.0	550.0	160.0
				STD. DEV.:		37.6	0.0	132.0	68.2	189.9	56.4
				n:		8	9	7	9	7	7

SUSPENDED SOLIDS RESULTS

1984-1985 TRIBUTARY SURVEY
SUSPENDED SEDIMENTS--METALS

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
1	4	1	840414	30026	53		5.96	0.55	13	49	31	26000	26.00	0.060		32		110.00
1		1	840414	30027	57		6.50	0.46	13	46	31	26000	24.00	0.060		32		110.00
2		1	840817	30508	53		11.11	1.10	16	42	31	28000	28.00	0.040		26		120.00
2		1	840817	30509	57		9.32	1.10	16	38	29	27000	29.00	0.050		26		120.00
3		1	841114	36207	53		2.80	0.86	13	51	38	34000	32.00	0.050		26		120.00
3		1	841114	36208	57		2.95	0.84	12	46	31	32000	28.00	0.050		31		140.00
5		1	850305	10168	53	32000	8.71	1.50	16	43	54	36000	32.00	0.060		29		120.00
5		1	850305	10169	57	34000	10.20	1.40	17	44	47	38000	32.00	0.050		37	1	140.00
6		1	850322	10195	53	25000	6.62	0.64	17	43	43	30000	23.00	0.050	650	39	0	160.00
6		1	850322	10196	57	28000	6.72	0.60	18	47	45	33000	24.00	0.050		26	0	110.00
7		1	850707	10121	53	25000	12.82	0.52	18	71	38	29000	29.00	0.040	830	27	0	120.00
7		1	850707	10122	57	25000	8.26	0.56	18	62	37	29000	28.00	0.040	810	38	1	120.00
9		1	851117	16486	53	27000	10.40	0.20	14	43	41	31000	27.00	0.050	540	38	1	120.00
9		1	851117	16487	57	27000	10.32	0.20	14	43	42	30000	27.00	0.050	550	36	3	130.00
																35	3	130.00
				MEAN:		27875	8.05	0.75	15	48	38	30643	27.79	0.050	676	32	1	125.00
				MIN:		25000	2.80	0.20	12	38	29	26000	23.00	0.040	540	26	0	110.00
				MAX:		34000	12.82	1.50	18	71	54	38000	32.00	0.060	830	39	3	160.00
				STD. DEV.:		3180	2.85	0.39	2	8	7	3497	2.83	0.007	124	5	1	13.50
				n:		8	14.00	14.00	14	14	14	14	14.000	14	5	14	8	14.00
1		2	840415	30028	53		10.59	0.20	14	72	41	29000	27.00	0.080		45		130.00
2		2	840810	30505	53		5.46	1.10	17	120	210	27000	41.00	0.100		39		520.00
5		2	850303	10167	53	28000	10.10	1.10	16	39	28	35000	24.00	0.050		36	1	120.00
6		2	850316	10188	53	32000	9.30	0.40	19	84	51	38000	22.00	0.050	500	55	0	140.00
6		2	850316	10189	57	29000	9.30	0.58	19	78	54	36000	23.00	0.100	530	50	0	130.00
7		2	850706	10120	53	33000	10.90	0.76	19	140	190	37000	52.00		730	68	1	310.00

1984-1985 TRIBUTARY SURVEY
SUSPENDED SEDIMENTS METALS

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
1	4	1	840414	30026	53		5.96	0.55	13	49	31	26000	26.00	0.060		32		110.00
1		1	840414	30027	57		6.50	0.46	13	46	31	26000	24.00	0.060		32		110.00
2		1	840817	30508	53		11.11	1.10	16	42	31	28000	28.00	0.040		26		120.00
2		1	840817	30509	57		9.32	1.10	16	38	29	27000	29.00	0.050		26		120.00
3		1	841114	36207	53		2.80	0.86	13	51	38	34000	32.00	0.050		31		140.00
3		1	841114	36208	57		2.95	0.84	12	46	31	32000	28.00	0.050		29		120.00
5		1	850305	10168	53	32000	8.71	1.50	16	43	54	36000	32.00	0.060		37	1	140.00
5		1	850305	10169	57	34000	10.20	1.40	17	44	47	38000	32.00	0.050		39	0	160.00
6		1	850322	10195	53	25000	6.62	0.64	17	43	43	30000	23.00	0.050	650	26	0	110.00
6		1	850322	10196	57	28000	6.72	0.60	18	47	45	33000	24.00	0.050		27	0	120.00
7		1	850707	10121	53	25000	12.82	0.52	18	71	38	29000	29.00	0.040	830	38	1	120.00
7		1	850707	10122	57	25000	8.26	0.56	18	62	37	29000	28.00	0.040	810	38	1	120.00
9		1	851117	16486	53	27000	10.40	0.20	14	43	41	31000	27.00	0.050	540	36	3	130.00
9		1	851117	16487	57	27000	10.32	0.20	14	43	42	30000	27.00	0.050	550	35	3	130.00
				MEAN:		27875	8.05	0.75	15	48	38	30643	27.79	0.050	676	32	1	125.00
				MIN:		25000	2.80	0.20	12	38	29	26000	23.00	0.040	540	26	0	110.00
				MAX:		34000	12.82	1.50	18	71	54	38000	32.00	0.060	830	39	3	160.00
				STD. DEV.:		3180	2.85	0.39	2	8	7	3497	2.83	0.007	124	5	1	13.50
				n:		8	14.00	14.00	14	14	14	14	14.000	14	5	14	8	14.00
1		2	840415	30028	53		10.59	0.20	14	72	41	29000	27.00	0.080		45		130.00
2		2	840810	30505	53		5.46	1.10	17	120	210	27000	41.00	0.100		39		520.00
5		2	850303	10167	53	28000	10.10	1.10	16	39	28	35000	24.00	0.050		36	1	120.00
6		2	850316	10188	53	32000	9.30	0.40	19	84	51	38000	22.00	0.050	500	55	0	140.00
6		2	850316	10189	57	29000	9.30	0.58	19	78	54	36000	23.00	0.100	530	50	0	130.00
7		2	850706	10120	53	33000	10.90	0.76	19	140	190	37000	52.00		730	68	1	310.00

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
8	4	2	850825	16289	53													
8		2	850825	16290	57		11.80										9	
8		2	850908	16300	53	25000	9.86	0.25	15	33	32	30000	29.00	0.040	700	36	8	110.00
8		2	850908	16301	57	26000	9.86	0.20	15	35	36	31000	28.00	0.040	720	37	7	120.00
9		2	851115	16479	53	33000	7.60	0.20	15	54	42	36000	23.00	0.050	490	43	4	140.00
9		2	851115	16480	57	35000	11.50	0.20	15	51	41	37000	22.00	0.040	470	41	4	140.00
				MEAN:		30125	9.66	0.50	16	71	73	33600	29.10	0.061	591	45	4	186.00
				MIN:		25000	5.46	0.20	14	33	28	27000	22.00	0.040	470	36	0	110.00
				MAX:		35000	11.80	1.10	19	140	210	38000	52.00	0.100	730	68	9	520.00
				STD. DEV.:		3407	1.73	0.35	2	34	64	3747	9.34	0.024	110	10	3	124.11
				n:		8	11.00	10.00	10	10	10	10	10.000	9	7	10	9	10.00
1		3	840409	30025	53		13.74	0.10	16	46	30	32000	32.00	0.060		40		180.00
2		3	840827	30510	53		35.69	1.70	24	53	40	36000	44.00	0.080		34		160.00
3		3	841115	36209	53		6.27	1.30	12	49	46	39000	32.00	0.060		35		180.00
5		3	850306	10170	53	34000	10.80	1.40	14	42	32	40000	33.00	0.060		38	1	180.00
6		3	850319	10191	53	32000	10.95	1.10	18	47	53	39000	29.00	0.060	330	35	0	180.00
7		3	850707	10123	53	22000	11.36	1.40	15	57	28	25000	25.00	0.030	790	29	1	140.00
9		3	851118	16488	53	38000	11.53	0.20	14	50	39	39000	26.00	0.050	230	43	2	180.00
				MEAN:		31500	14.33	1.03	16	49	38	35714	31.57	0.057	450	36	1	171.43
				MIN:		22000	6.27	0.10	12	42	28	25000	25.00	0.030	230	29	0	140.00
				MAX:		38000	35.69	1.70	24	57	53	40000	44.00	0.080	790	43	2	180.00
				STD. DEV.:		5895	8.96	0.58	4	5	8	5063	5.83	0.014	244	4	1	14.57
				n:		4	7.00	7.00	7	7	7	7	7.000	7	3	7	4	7.00
1		4	840408	30024	53		12.48	0.10	15	45	29	30000	32.00	0.070		36		170.00

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
2	4	4	840828	30511	53		17.61	1.40	18	47	25	36000	36.00	0.060		26		140.00
3		4	841116	36210	53		6.37	1.10	12	50	32	39000	38.00	0.060		31		190.00
5		4	850308	10172	53	17000	8.34	0.73	10	26	65	23000	20.00	0.030		21	0	91.00
6		4	850320	10193	53	30000	11.05	0.83	17	45	44	37000	29.00	0.050	390	30	0	180.00
7		4	850708	10124	53	35000	11.88	0.75	17	83	36	38000	33.00	0.050	430	38	1	160.00
9		4	851118	16489	53	39000	11.53	0.20	13	52	49	41000	28.00	0.050	250	40	2	180.00
				MEAN:		30250	11.32	0.73	15	50	40	34857	30.86	0.053	357	32	1	158.71
				MIN:		17000	6.37	0.10	10	26	25	23000	20.00	0.030	250	21	0	91.00
				MAX:		39000	17.61	1.40	18	83	65	41000	38.00	0.070	430	40	2	190.00
				STD. DEV.:		8288	3.27	0.43	3	16	13	5792	5.51	0.012	77	6	1	31.51
				n:		4	7.00	7.00	7	7	7	7	7.000	7	3	7	4	7.00
5	8	6	850228	10162	53	26000	7.00	0.95	14	41	32	28000	19.00	0.040		32	0	110.00
6		6	850313	10180	53	25000	6.70	0.63	15	41	41	25000	23.00	0.030	370	27	0	110.00
7		6	850701	10112	53	22000	7.72	0.58	17	68	37	25000	26.00	0.020	620	32	0	100.00
8		6	850823	16287	53	19000	6.82	0.44	14	44	26	22000	20.00	0.030	500	30	4	79.00
9		6	851111	16474	53	30000	7.36	0.21	14	180	39	28000	27.00	0.060	360	67	1	130.00
				MEAN:		24400	7.12	0.56	15	75	35	25600	23.00	0.036	463	38	1	105.80
				MIN:		19000	6.70	0.21	14	41	26	22000	19.00	0.020	360	27	0	79.00
				MAX:		30000	7.72	0.95	17	180	41	28000	27.00	0.060	620	67	4	130.00
				STD. DEV.:		3720	0.37	0.24	1	54	5	2245	3.16	0.014	106	15	2	16.57
				n:		5	5.00	5.00	5	5	5	5	5.000	5	4	5	5	5.00
1	10	5	840408	30023	53		11.85	0.10	14	170	37	28000	51.00	0.170		180		210.00
2		5	840816	30507	57		8.10	1.60	17	400	120	33000	86.00	0.280		470		510.00
3		5	841116	36211	53		7.49	3.40	14	1200	190	35000	730.00	0.380		850		930.00

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
5	10	5	850309	10174	53	25000	10.12	1.20	12	62	73	31000	32.00	0.090		67	1	160.00
6		5	850320	10194	53	31000	10.10	0.69	18	190	78	36000	41.00	0.210	410	160	0	230.00
7		5	850708	10125	53	29000	9.80	1.50	17	510	120	35000	89.00		350	530	1	470.00
8		5	850908	16299	53	25000	14.23	0.48	12	590	92	35000	93.00	0.250	310	840	7	470.00
9		5	851119	16490	53	36000	13.80	0.20	14	120	51	39000	40.00	0.080	290	140	3	250.00
				MEAN:		29200	10.69	1.15	15	605	95	34000	145.25	0.209	340	405	2	403.75
				MIN:		25000	7.49	0.10	12	62	37	28000	32.00	0.080	290	67	0	160.00
				MAX:		36000	14.23	3.40	18	1200	190	39000	730.00	0.380	410	850	7	930.00
				STD. DEV.:		4118	2.29	1.00	2	350	45	3122	222.20	0.099	46	296	2	236.59
				n:		5	8.00	8.00	8	8	8	8	8.000	7	4	8	5	8.00
1		6	840407	30022	53		14.06	1.50	16	480	140	30000	170.00	0.450		220		2600.00
2		6	840828	30512	53		12.45	11.00	22	460	130	36000	240.00	0.350		170		930.00
3		6	841117	36212	53			6.00	16	120	160	37000	190.00	0.470		74		530.00
6		6	850317	10190	53	25000	10.70	7.80	19	190	760	33000	210.00	0.490	410	100	1	660.00
7		6	850709	10126	53	21000	11.88	8.30	20	250	140	36000	500.00	0.450	6500	110	1	740.00
8		6	850907	16297	53	27000	13.80	3.10	14	68	98	36000	140.00	0.290	370	53	5	410.00
9		6	851119	16491	53	28000	12.70	5.30	15	110	83	32000	140.00	0.200	310	74	2	510.00
				MEAN:		25250	12.60	6.14	17	240	216	34286	227.14	0.386	1898	114	2	911.43
				MIN:		21000	10.70	1.50	14	68	83	30000	140.00	0.200	310	53	1	410.00
				MAX:		28000	14.06	11.00	22	480	760	37000	500.00	0.490	6500	220	5	2600.00
				STD. DEV.:		2681	1.14	2.99	3	156	223	2433	116.34	0.101	2657	55	2	707.34
				n:		4	6.00	7.00	7	7	7	7	7.000	7	4	7	4	7.00
1		7	840405	30020	53		11.85	0.10	15	51	25	31000	38.00	0.060		39		140.00
2		7	840829	30513	53		15.20	1.40	19	58	27	37000	39.00	0.060		31		150.00

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
3	10	7	841119	36213	53		1.57	0.46	5	14	23	11000	16.00	0.020		8		52.00
5		7	850309	10173	53	33000	10.20	1.20	14	41	35	38000	29.00	0.050		34	0	150.00
6		7	850319	10192	53	36000	10.90	0.62	18	50	33	40000	29.00	0.050	330	33	1	160.00
7		7	850709	10127	53	28000	10.76	0.48	17	85	32	30000	29.00	0.030	690	45	1	140.00
8		7	850907	16298	53	29000	13.40	0.20	15	35	39	34000	38.00	0.060	960	37	7	150.00
9		7	851120	16492	53	34000	11.30	0.20	14	47	33	36000	28.00	0.050	320	38	1	150.00
				MEAN:		32000	10.65	0.58	15	48	31	32125	30.75	0.048	575	33	2	136.50
				MIN:		28000	1.57	0.10	5	14	23	11000	16.00	0.020	320	8	0	52.00
				MAX:		36000	15.20	1.40	19	85	39	40000	39.00	0.060	960	45	7	160.00
				STD. DEV.:		3033	3.76	0.45	4	19	5	8594	7.14	0.014	268	10	3	32.49
				n:		5	8.00	8.00	8	8	8	8	8.000	8	4	8	5	8.00
1		8	840406	30021	53		10.28	0.10	13	39	29	24000	36.00	0.060		31		120.00
				MEAN:			10.28	0.10	13	39	29	24000	36.00	0.060		31		120.00
				MIN:			10.28	0.10	13	39	29	24000	36.00	0.060		31		120.00
				MAX:			10.28	0.10	13	39	29	24000	36.00	0.060		31		120.00
				STD. DEV.:			0.00	0.00	0	0	0	0	0.00	0.000		0		0.00
				n:		0	1.00	1.00	1	1	1	1	1.000	1	0	1	0	1.00
1	15	3	840418	30031	53		7.69	0.41	13	170	110	25000	70.00	0.560		41		260.00
1		3	840418	30032	57		7.58	0.40	12	150	95	23000	63.00	0.500		42		230.00
2		3	840808	30501	53		25.96	1.70	11	850	590	19000	150.00	1.000		74		730.00
2		3	840808	30502	57		25.96	1.60	10	690	510	16000	130.00			68		630.00
3		3	841105	36201	53		12.59	0.55	10	280	130	33000	68.00	0.430		54		350.00
5		3	850227	10160	53	20000	7.88	1.00	12	66	46	23000	31.00	0.300		32	2	150.00
5		3	850227	10161	57	30000	10.60	1.20	15	85	67	32000	43.00	0.320		40	2	200.00

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
6	15	3	850311	10175	53	26000	9.20	1.20	14	66	48	30000	30.00	0.380		34	1	160.00
6		3	850311	10176	57	28000	10.60	1.20	14	62	55	31000	30.00	0.390		35	1	170.00
7		3	850702	10114	53	18000	7.40	1.10	14	170	600	18000	110.00		390	43	1	560.00
8		3	850822	16285	53													
8		3	850822	16286	57	11000	5.73	0.86	10	140	190	7900	86.00		180	27	5	200.00
9		3	851114	16477	53	32000	9.75	0.20	14	110	100	30000	50.00	0.240	290	54	4	220.00
9		3	851114	16478	57	29000	9.70	0.26	14	100	99	28000	52.00	0.250	300	49	4	210.00
				MEAN:		24250	11.59	0.90	13	226	203	24300	70.23	0.437	290	46	2	313.08
				MIN:		11000	5.73	0.20	10	62	46	7900	30.00	0.240	180	27	1	150.00
				MAX:		32000	25.96	1.70	15	850	600	33000	150.00	1.000	390	74	5	730.00
				STD. DEV.:		6759	6.36	0.48	2	241	203	7169	37.30	0.212	74	13	1	188.45
				n:		8	13.00	13.00	13	13	13	13	13.000	10	4	13	8	13.00
1		4	840419	30033	53		7.25	0.28	12	46	25	24000	22.00	0.480		35		150.00
2		4	840809	30504	53		12.90	0.46	14	42	31	36000	25.00	0.370		32		190.00
3		4	841105	36200	53		9.48	0.20	11	54	28	34000	26.00	0.320		33		180.00
5		4	850228	10163	53	21000	8.22	0.97	13	35	28	26000	21.00	0.520		30	1	120.00
6		4	850313	10181	53	29000	8.78	0.69	17	44	60	31000	23.00	0.480	410	33	0	150.00
7		4	850701	10113	53	21000	9.73	0.88	18	70	47	27000	46.00		1300	38	1	150.00
8		4	850823	16288	53	23000	11.70	0.51	16	50	56	28000	50.00	0.350	1100	42	7	150.00
9		4	851113	16476	53	37000	8.96	0.20	15	51	35	34000	23.00	0.160	340	40	1	160.00

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
				MEAN:		26200	9.63	0.52	15	49	39	30000	29.50	0.383	788	35	2	156.25
				MIN:		21000	7.25	0.20	11	35	25	24000	21.00	0.160	340	30	0	120.00
				MAX:		37000	12.90	0.97	18	70	60	36000	50.00	0.520	1300	42	7	190.00
				STD. DEV.:		6145	1.73	0.28	2	10	13	4093	10.83	0.115	419	4	2	19.96
				n:		5	8.00	8.00	8	8	8	8	8.000	7	4	8	5	8.00
1	15	5	840416	30030	53		8.34	0.33	13	47	26	26000	17.00	0.070		39		170.00
2		5	840807	30500	53		22.17	0.37	13	25	29	26000	24.00	0.230		21		210.00
3		5	841107	36205	53			0.70	12	43	46	30000	22.00	0.060		33		190.00
5		5	850302	10165	53	28000	8.80	1.30	16	40	34	33000	26.00	0.060		38	1	160.00
6		5	850314	10182	53	25000	10.50	0.80	15	37	39	29000	22.00	0.050	290	32	0	150.00
7		5	850704	10118	53		10.42										1	
9		5	851115	16481	53	32000	10.20	0.20	14	52	180	31000	34.00	0.050	340	57	3	190.00
				MEAN:		28333	11.74	0.62	14	41	59	29167	24.17	0.087	315	37	1	178.33
				MIN:		25000	8.34	0.20	12	25	26	26000	17.00	0.050	290	21	0	150.00
				MAX:		32000	22.17	1.30	16	52	180	33000	34.00	0.230	340	57	3	210.00
				STD. DEV.:		2867	4.74	0.37	1	8	55	2544	5.18	0.064	25	11	1	20.34
				n:		3	6.00	6.00	6	6	6	6	6.000	6	2	6	4	6.00
1		6	840415	30029	53		8.23	1.00	10	960	69	27000	50.00	0.510		31		270.00
2		6	840810	30506	53		9.14	1.40	18	180	39	33000	26.00	0.110		28		150.00
3		6	841107	36204	53		7.71	0.56	12	140	44	35000	21.00	0.080		35		170.00
5		6	850302	10166	53	36000	7.11	0.80	14	53	33	37000	25.00	0.060		38	1	130.00
6		6	850314	10183	53	34000	7.34	0.45	16	53	44	35000	21.00	0.040	240	33	0	120.00
7		6	850704	10117	53	30000	8.03	0.75	18	110	33	32000	25.00	0.090	370	40	1	140.00
9		6	851113	16475	53	37000	8.11	0.20	14	56	29	36000	21.00	0.050	230	43	0	120.00

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
				MEAN:		34250	7.95	0.74	15	222	42	33571	27.00	0.134	280	35	0	157.14
				MIN:		30000	7.11	0.20	10	53	29	27000	21.00	0.040	230	28	0	120.00
				MAX:		37000	9.14	1.40	18	960	69	37000	50.00	0.510	370	43	1	270.00
				STD. DEV.:		2681	0.62	0.36	3	305	12	3110	9.61	0.155	64	5	0	48.91
				n:		4	7.00	7.00	7	7	7	7	7.000	7	3	7	4	7.00
1	15	7	840419	30034	53		9.46	0.33	9	310	120	17000	59.00	0.620		63		280.00
2		7	840809	30503	53		23.29	1.20	15	56	75	38000	61.00	0.240		42		480.00
3		7	841106	36202	53			0.30	9	97	76	23000	38.00	0.340		37		150.00
3		7	841106	36203	57			0.30	9	99	91	23000	52.00			38		150.00
5		7	850301	10164	53	29000	8.22	1.10	11	81	1100	22000	35.00	0.340		42	0	170.00
6		7	850315	10184	53	38000	11.14	0.81	9	150	310	18000	45.00	0.480	280	59	0	200.00
7		7	850703	10116	53	62000	19.60	11.00	9	190	110	13000	55.00		240	47	1	220.00
8		7	850912	16307	53	18000	6.52	3.70	10	44	74	15000	36.00	0.140	330	43	1	140.00
9		7	851116	16482	53	20000	10.40	0.96	13	69	78	22000	72.00	0.460	370	46	2	420.00
				MEAN:		33400	12.66	2.19	10	122	226	21222	50.33	0.374	305	46	1	245.56
				MIN:		18000	6.52	0.30	9	44	74	13000	35.00	0.140	240	37	0	140.00
				MAX:		62000	23.29	11.00	15	310	1100	38000	72.00	0.620	370	63	2	480.00
				STD. DEV.:		15970	5.81	3.27	2	79	317	6860	12.04	0.148	49	8	1	117.58
				n:		5	7.00	9.00	9	9	9	9	9.000	7	4	9	5	9.00

1984-1985 TRIBUTARY SURVEY
SUSPENDED SEDIMENTS--PESTICIDES

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
1	4	1	840414	30026	53	0	0	0	0	0	1	0
1		1	840414	30027	57	0	0	0	0	0	1	0
2		1	840817	30508	53	0	0	0	0	0	6	0
2		1	840817	30509	57	0	0	0	0	0	2	0
3		1	841114	36207	53	0	0				3	
3		1	841114	36208	57	0	0				1	
5		1	850305	10168	53	0	0	0	0	0	0	0
5		1	850305	10169	57	0	0	0	0	0	8	0
6		1	850322	10195	53	0	0	0	0	0	2	0
6		1	850322	10196	57	0	0	0	0	0	3	0
7		1	850707	10121	53	0	0	0	0	0	0	0
7		1	850707	10122	57	0	0	0	0	0	0	0
9		1	851117	16486	53	0	0	0	0	0	6	0
9		1	851117	16487	57	0	0	0	0	0	7	0
				MEAN:		0	0	0	0	0	3	0
				MIN:		0	0	0	0	0	0	0
				MAX:		0	0	0	0	0	8	0
				STD. DEV.:		0	0	0	0	0	3	0
				n:		14	14	12	12	12	14	12
1		2	840415	30028	53	0	0	0	0	0	1	0
2		2	840810	30505	53	0	0	0	0	0	2	0
5		2	850303	10167	53	0	0	0	0	0	1	0
6		2	850316	10188	53	0	0	0	0	0	2	0
6		2	850316	10189	57	0	0	0	0	0	2	0
7		2	850706	10120	53	0	0	0	0	0	0	0
8		2	850825	16289	53	0	0	0	0	0	0	0
8		2	850825	16290	57	0	0	0	0	0	2	0
8		2	850908	16300	53	0	0	0	0	0	6	0
8		2	850908	16301	57	0	0	0	0	0	13	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
9	4	2	851115	16479	53	0	0	0	0	0	0	0
9		2	851115	16480	57	0	0	0	0	0	1	0
				MEAN:		0	0	0	0	0	3	0
				MIN:		0	0	0	0	0	0	0
				MAX:		0	0	0	0	0	13	0
				STD. DEV.:		0	0	0	0	0	4	0
				n:		12	12	12	12	12	12	12
1		3	840409	30025	53	0	0	0	0	0	2	0
2		3	840827	30510	53	0	0	0	0	0	1	0
3		3	841115	36209	53	0	0	0	0	0	0	0
5		3	850306	10170	53	0	0	0	0	0	0	0
6		3	850319	10191	53	0	0	0	0	0	12	0
7		3	850707	10123	53	0	0	42	0	0	6	0
9		3	851118	16488	53	0	0	0	0	0	4	0
				MEAN:		0	0	6	0	0	4	0
				MIN:		0	0	0	0	0	0	0
				MAX:		0	0	42	0	0	12	0
				STD. DEV.:		0	0	15	0	0	4	0
				n:		7	7	7	7	7	7	7
1		4	840408	30024	53	0	0	0	5	5	7	5
2		4	840828	30511	53	0	0	0	0	0	5	0
3		4	841116	36210	53	0	0	0	0	0	7	0
5		4	850308	10172	53	0	0	0	0	10	9	0
6		4	850320	10193	53	0	0	0	0	0	8	0
7		4	850708	10124	53	0	0	0	0	0	18	25
9		4	851118	16489	53	0	0	0	0	5	19	20

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
				MEAN:		0	0	0	1	3	10	7
				MIN:		0	0	0	0	0	5	0
				MAX:		0	0	0	5	10	19	25
				STD. DEV.:		0	0	0	2	4	5	10
				n:		7	7	7	7	7	7	7
5	8	6	850228	10162	53	0	0	0	0	0	0	0
6		6	850313	10180	53	0	0	0	0	0	0	0
7		6	850701	10112	53	0	0	0	0	0	0	0
8		6	850823	16287	53	0	0	0	0	0	0	0
9		6	851111	16474	53	0	0	0	5	0	1	0
				MEAN:		0	0	0	1	0	0	0
				MIN:		0	0	0	0	0	0	0
				MAX:		0	0	0	5	0	1	0
				STD. DEV.:		0	0	0	2	0	0	0
				n:		5	5	5	5	5	5	5
1	10	5	840408	30023	53	0	0	0	0	0	3	0
2		5	840816	30507	57	0	0	0	0	0	2	0
3		5	841116	36211	53	0	0	0	0	0	4	0
5		5	850309	10174	53	0	0	0	0	0	0	0
6		5	850320	10194	53	0	0	0	0	0	6	0
7		5	850708	10125	53							
8		5	850908	16299	53	0	0	0	0	0	9	0
9		5	851119	16490	53	0	0	0	0	10	22	15

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
				MEAN:		0	0	0	0	1	7	2
				MIN:		0	0	0	0	0	0	0
				MAX:		0	0	0	0	10	22	15
				STD. DEV.:		0	0	0	0	3	7	5
				n:		7	7	7	7	7	7	7
1	10	6	840407	30022	53	0	0	0	10	10	11	5
2		6	840828	30512	53	0	10	0	0	0	0	0
3		6	841117	36212	53	0	0	0	0	0	14	0
6		6	850317	10190	53	0	0	0	15	50	14	45
7		6	850709	10126	53							
8		6	850907	16297	53	0	0	0	5	15	18	10
9		6	851119	16491	53	0	0	0	0	15	33	25
				MEAN:		0	2	0	5	15	15	14
				MIN:		0	0	0	0	0	0	0
				MAX:		0	10	0	15	50	33	45
				STD. DEV.:		0	4	0	6	17	10	16
				n:		6	6	6	6	6	6	6
1		7	840405	30020	53	0	0	0	0	0	9	0
2		7	840829	30513	53	0	0	0	0	0	2	0
3		7	841119	36213	53	0	0	0	0	0	4	0
5		7	850309	10173	53	0	0	0	5	0	0	20
6		7	850319	10192	53	0	0	0	0	0	1	0
7		7	850709	10127	53							
8		7	850907	16298	53	0	0	0	0	0	0	0
9		7	851120	16492	53	0	0	0	0	0	10	5

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
				MEAN:		0	0	0	1	0	4	4
				MIN:		0	0	0	0	0	0	0
				MAX:		0	0	0	5	0	10	20
				STD. DEV.:		0	0	0	2	0	4	7
				n:		7	7	7	7	7	7	7
1	10	8	840406	30021	53	0	0	0	0	0	2	0
				MEAN:		0	0	0	0	0	2	0
				MIN:		0	0	0	0	0	2	0
				MAX:		0	0	0	0	0	2	0
				STD. DEV.:		0	0	0	0	0	0	0
				n:		1	1	1	1	1	1	1
1	15	3	840418	30031	53	0	0	0	0	0	0	0
1		3	840418	30032	57	0	0	0	0	0	0	0
2		3	840808	30501	53	0	0	0	0	0	0	0
2		3	840808	30502	57	0	0	0	0	0	1	0
3		3	841105	36201	53	0	0	0	0	0	0	0
5		3	850227	10160	53	0	0	15	0	0	0	0
5		3	850227	10161	57	0	0	10	0	0	31	0
6		3	850311	10175	53	0	0	0	0	0	0	0
6		3	850311	10176	57	0	0	0	0	0	0	0
7		3	850702	10114	53	0	0	9	0	0	0	0
8		3	850822	16285	53	0	0	0	0	0	0	0
8		3	850822	16286	57	0	0	0	0	0	0	0
9		3	851114	16477	53	0	0	0	0	0	0	0
9		3	851114	16478	57	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
				MEAN:		0	0	2	0	0	2	0
				MIN:		0	0	0	0	0	0	0
				MAX:		0	0	15	0	0	31	0
				STD. DEV.:		0	0	4	0	0	8	0
				n:		14	14	14	14	14	14	14
1	15	4	840419	30033	53							
2		4	840809	30504	53	0	0	0	0	0	0	0
3		4	841105	36200	53	0	0	0	0	0	1	0
5		4	850228	10163	53	0	0	0	0	0	0	0
6		4	850313	10181	53	0	5	0	0	0	0	0
7		4	850701	10113	53	0	0	0	0	0	1	0
8		4	850823	16288	53	0	0	0	0	0	1	0
9		4	851113	16476	53	0	0	0	0	0	0	0
				MEAN:		0	1	0	0	0	0	0
				MIN:		0	0	0	0	0	0	0
				MAX:		0	5	0	0	0	1	0
				STD. DEV.:		0	2	0	0	0	0	0
				n:		7	7	7	7	7	7	7
1		5	840416	30030	53	0	0	0	0	0	1	0
2		5	840807	30500	53	0	0	0	0	0	2	0
3		5	841107	36205	53	0	0	0	0	0	0	0
5		5	850302	10165	53	0	0	0	0	0	2	0
6		5	850314	10182	53	0	0	0	0	0	0	0
7		5	850704	10118	53	0	0	0	0	0	0	0
9		5	851115	16481	53	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
				MEAN:		0	0	0	0	0	1	0
				MIN:		0	0	0	0	0	0	0
				MAX:		0	0	0	0	0	2	0
				STD. DEV.:		0	0	0	0	0	1	0
				n:		7	7	7	7	7	7	7
1	15	6	840415	30029	53	0	0	0	0	0	0	0
2		6	840810	30506	53	0	0	0	0	0	2	0
3		6	841107	36204	53	0	0	0	0	0	1	0
5		6	850302	10166	53	0	0	0	0	0	3	0
6		6	850314	10183	53	0	0	0	0	0	1	0
7		6	850704	10117	53	0	0	0	0	0	0	0
9		6	851113	16475	53	0	0	0	0	0	1	0
				MEAN:		0	0	0	0	0	1	0
				MIN:		0	0	0	0	0	0	0
				MAX:		0	0	0	0	0	3	0
				STD. DEV.:		0	0	0	0	0	1	0
				n:		7	7	7	7	7	7	7
1		7	840419	30034	53	0	0	0	0	0	0	0
2		7	840809	30503	53	0	0	0	0	0	0	0
3		7	841106	36202	53	0	0	3	0	0	0	0
3		7	841106	36203	57	0	0	0	0	0	2	0
5		7	850301	10164	53	0	0	3	0	0	0	0
6		7	850315	10184	53	0	0	0	0	0	4	0
7		7	850703	10116	53							
8		7	850912	16307	53	0		0	0	0		0
9		7	851116	16482	53	0	0	0	0	0	14	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
				MEAN:		0	0	1	0	0	3	0
				MIN:		0	0	0	0	0	0	0
				MAX:		0	0	3	0	0	14	0
				STD. DEV.:		0	0	1	0	0	5	0
				n:		8	7	8	8	8	7	8

1984-1985 TRIBUTARY SURVEY
SUSPENDED SOLIDS--PESTICIDES

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSUPHAN I ng/g	ENDOSUPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
1	4	1	840414	30026	53	0	0	0	0	0	0	0	0	0	0	0	0
1		1	840414	30027	57	0	0	0	0	0	0	0	0	0	3	0	0
2		1	840817	30508	53	0	0	0	0	0	8	0	6	0	0	0	0
2		1	840817	30509	57	0	0	0	0	0	2	0	0	0	0	0	0
3		1	841114	36207	53	0											
3		1	841114	36208	57	0											
5		1	850305	10168	53	0	0	0	0	0	3	0	0	0	0	0	0
5		1	850305	10169	57	0	0	0	0	0	0	0	0	0	0	0	0
6		1	850322	10195	53	0	0	0	0	0	0	0	0	0	0	0	0
6		1	850322	10196	57	0	0	0	0	0	0	0	0	0	0	0	0
7		1	850707	10121	53	0	0	0	0	0	5	0	0	0	4	0	0
7		1	850707	10122	57	0	0	0	0	0	6	32	0	0	7	0	23
9		1	851117	16486	53	0	0	0	0	0	0	0	0	0	0	0	0
9		1	851117	16487	57	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0	0	0	0	0	2	3	1	0	1.17	0.00	1.92
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	0	0	0	0	8	32	6	0	7.00	0.00	23.00
				STD. DEV.:		0	0	0	0	0	3	9	2	0	2.19	0.00	6.36
				n:		14	12	12	12	12	12	12	12	12	12	12	12
1		2	840415	30028	53	0	0	0	0	0	14	0	64	0	0	0	0
2		2	840810	30505	53	0	0	0	0	0	0	0	0	0	0	0	0
5		2	850303	10167	53	0	0	0	0	0	3	0	0	0	0	0	0
6		2	850316	10188	53	0	0	0	0	0	0	0	0	0	0	0	0
6		2	850316	10189	57	0	0	0	0	0	0	0	0	0	0	0	0
7		2	850706	10120	53	0	0	0	2	2	3	0	0	0	0	0	0
8		2	850825	16289	53	0	0	0	0	0	2	0	0	0	0	0	0
8		2	850825	16290	57	0	0	0	0	0	7	0	0	0	5	0	0
8		2	850908	16300	53	0	0	0	0	0	0	5	0	0	0	0	0
8		2	850908	16301	57	0	0	0	0	0	0	5	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSUPHAN I ng/g	ENDOSUPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
9	4	2	851115	16479	53	0	0	0	0	0	0	0	0	0	0	0	0
9		2	851115	16480	57	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0	0	0	0	0	2	1	5	0	0.42	0.00	0.00
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	0	0	2	2	14	5	64	0	5.00	0.00	0.00
				STD. DEV.:		0	0	0	1	1	4	2	18	0	1.38	0.00	0.00
				n:		12	12	12	12	12	12	12	12	12	12	12	12
1		3	840409	30025	53	0	0	0	0	0	0	0	0	0	0	0	0
2		3	840827	30510	53	0	0	0	0	0	3	0	0	0	0	0	2
3		3	841115	36209	53	0	0	0	0	0	4	0	0	0	0	0	0
5		3	850306	10170	53	0	0	0	0	0	0	0	0	0	0	0	0
6		3	850319	10191	53	0	0	0	0	0	0	0	0	0	0	0	0
7		3	850707	10123	53	0	0	0	0	0	0	0	19	28	0	0	55
9		3	851118	16488	53	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0	0	0	0	0	1	0	3	4	0.00	0.00	8.14
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	0	0	0	0	4	0	19	28	0.00	0.00	55.00
				STD. DEV.:		0	0	0	0	0	2	0	7	10	0.00	0.00	19.14
				n:		7	7	7	7	7	7	7	7	7	7	7	7
1		4	840408	30024	53	0	0	0	0	20	0	0	0	0	0	0	0
2		4	840828	30511	53	0	0	0	0	0	5	0	0	0	0	0	0
3		4	841116	36210	53	0	0	0	0	0	0	0	0	0	0	0	0
5		4	850308	10172	53	0	0	0	0	0	0	0	0	0	0	0	0
6		4	850320	10193	53	0	2	0	0	0	0	0	0	0	0	0	0
7		4	850708	10124	53	0	0	0	0	0	4	0	0	0	3	0	0
9		4	851118	16489	53	0	0	0	0	0	5	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSUPHAN I ng/g	ENDOSUPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
				MEAN:		0	0	0	0	3	2	0	0	0	0.43	0.00	0.00
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	2	0	0	20	5	0	0	0	3.00	0.00	0.00
				STD. DEV.:		0	1	0	0	7	2	0	0	0	1.05	0.00	0.00
				n:		7	7	7	7	7	7	7	7	7	7	7	7
5	8	6	850228	10162	53	0	0	0	0	0	3	0	0	0	0	0	0
6		6	850313	10180	53	0	0	0	0	0	0	0	0	0	0	0	0
7		6	850701	10112	53	0	0	0	4	3	0	0	0	0	0	0	0
8		6	850823	16287	53	0	0	0	0	0	0	0	0	0	0	0	0
9		6	851111	16474	53	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0	0	0	1	1	1	0	0	0	0.00	0.00	0.00
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	0	0	4	3	3	0	0	0	0.00	0.00	0.00
				STD. DEV.:		0	0	0	2	1	1	0	0	0	0.00	0.00	0.00
				n:		5	5	5	5	5	5	5	5	5	5	5	5
1	10	5	840408	30023	53	0	0	0	0	0	0	0	0	0	0	0	0
2		5	840816	30507	57	0	0	0	0	0	4	0	0	0	0	0	0
3		5	841116	36211	53	0	0	0	0	0	0	0	0	0	0	0	0
5		5	850309	10174	53	0	0	0	3	2	0	0	0	0	0	0	0
6		5	850320	10194	53	0	0	0	0	0	0	0	0	0	0	0	0
7		5	850708	10125	53												
8		5	850908	16299	53	0	0	0	0	0	10	5	0	0	0	0	0
9		5	851119	16490	53	0	0	0	2	0	5	27	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSUPHAN I ng/g	ENDOSUPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
				MEAN:		0	0	0	1	0	3	5	0	0	0.00	0.00	0.00
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	0	0	3	2	10	27	0	0	0.00	0.00	0.00
				STD. DEV.:		0	0	0	1	1	4	9	0	0	0.00	0.00	0.00
				n:		7	7	7	7	7	7	7	7	7	7	7	7
1	10	6	840407	30022	53	0	2	0	5	5	0	220	0	0	0	5	0
2		6	840828	30512	53	0	0	0	0	0	0	0	0	0	0	0	0
3		6	841117	36212	53	0	0	0	0	0	2	0	0	0	0	0	[illegible]
6		6	850317	10190	53	0	3	0	20	30	0	0	0	0	0	0	0
7		6	850709	10126	53												
8		6	850907	16297	53	0	0	0	10	10	10	0	0	15	25	15	0
9		6	851119	16491	53	0	0	10	6	6	9	38	12	0	9	0	0
				MEAN:		0	1	2	7	9	4	43	2	3	5.67	3.33	0.00
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	3	10	20	30	10	220	12	15	25.00	15.00	0.00
				STD. DEV.:		0	1	4	7	10	4	80	4	6	9.25	5.53	0.00
				n:		6	6	6	6	6	6	6	6	6	6	6	6
1		7	840405	30020	53	0	0	0	0	0	0	0	0	0	0	0	0
2		7	840829	30513	53	0	0	0	0	0	0	0	0	0	0	0	0
3		7	841119	36213	53	0	0	0	0	0	0	0	0	0	0	0	0
5		7	850309	10173	53	0	0	0	0	0	0	0	0	0	0	0	0
6		7	850319	10192	53	0	2	0	0	0	0	0	0	0	0	0	0
7		7	850709	10127	53												
8		7	850907	16298	53	0	0	0	0	0	0	0	0	0	6	0	2
9		7	851120	16492	53	0	0	0	0	0	5	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSUPHAN I ng/g	ENDOSUPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
				MEAN:		0	0	0	0	0	1	0	0	0	0.86	0.00	0.29
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	2	0	0	0	5	0	0	0	6.00	0.00	2.00
				STD. DEV.:		0	1	0	0	0	2	0	0	0	2.10	0.00	0.70
				n:		7	7	7	7	7	7	7	7	7	7	7	7
1	10	8	840406	30021	53	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				STD. DEV.:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				n:		1	1	1	1	1	1	1	1	1	1	1	1
1	15	3	840418	30031	53	0	0	0	0	0	4	0	0	0	0	0	0
1		3	840418	30032	57	0	0	0	0	0	0	0	0	0	0	0	0
2		3	840808	30501	53	0	0	0	0	0	2	0	0	0	0	0	0
2		3	840808	30502	57	0	0	0	0	0	0	0	0	0	0	0	0
3		3	841105	36201	53	0	0	0	0	0	0	0	0	0	0	0	0
5		3	850227	10160	53	0	0	0	0	0	13	0	0	5	25	0	0
5		3	850227	10161	57	0	0	0	0	0	88	0	0	15	0	0	25
6		3	850311	10175	53	0	0	0	0	0	11	7	0	13	0	28	0
6		3	850311	10176	57	0	0	0	0	0	0	0	0	0	0	0	0
7		3	850702	10114	53	0	0	0	0	0	0	0	0	0	0	0	0
8		3	850822	16285	53	0	0	0	0	0	7	6	0	6	0	0	0
8		3	850822	16286	57	0	0	0	0	0	0	7	0	0	0	0	0
9		3	851114	16477	53	0	0	0	0	0	0	19	0	0	0	0	0
9		3	851114	16478	57	0	0	0	0	0	11	42	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSUPHAN I ng/g	ENDOSUPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
				MEAN:		0	0	0	0	0	10	6	0	3	1.79	2.00	1.79
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	0	0	0	0	88	42	0	15	25.00	28.00	25.00
				STD. DEV.:		0	0	0	0	0	22	11	0	5	6.44	7.21	6.44
				n:		14	14	14	14	14	14	14	14	14	14	14	14
1	15	4	840419	30033	53												
2		4	840809	30504	53	0	0	0	0	0	0	0	0	0	0	0	0
3		4	841105	36200	53	0	0	0	0	0	0	0	0	0	0	0	0
5		4	850228	10163	53	0	0	0	0	0	5	0	0	0	0	0	0
6		4	850313	10181	53	0	0	0	0	0	0	0	0	0	0	0	0
7		4	850701	10113	53	0	0	0	5	6	0	0	0	0	0	0	0
8		4	850823	16288	53	0	0	0	0	0	3	0	0	0	0	0	4
9		4	851113	16476	53	0	0	0	0	0	3	0	0	0	0	0	0
				MEAN:		0	0	0	1	1	2	0	0	0	0.00	0.00	0.57
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	0	0	5	6	5	0	0	0	0.00	0.00	4.00
				STD. DEV.:		0	0	0	2	2	2	0	0	0	0.00	0.00	1.40
				n:		7	7	7	7	7	7	7	7	7	7	7	7
1		5	840416	30030	53	0	1	0	0	2	4	0	0	0	10	0	0
2		5	840807	30500	53	0	0	0	0	0	24	0	120	0	17	19	0
3		5	841107	36205	53	0	0	0	0	0	0	0	0	0	0	0	0
5		5	850302	10165	53	0	0	0	0	0	2	0	0	0	0	0	0
6		5	850314	10182	53	0	0	0	0	0	0	0	0	0	0	0	0
7		5	850704	10118	53	0	0	0	0	0	0	0	0	0	0	0	0
9		5	851115	16481	53	0	0	0	0	0	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSUPHAN I ng/g	ENDOSUPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
				MEAN:		0	0	0	0	0	4	0	17	0	3.86	2.71	0.00
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	1	0	0	2	24	0	120	0	17.00	19.00	0.00
				STD. DEV.:		0	0	0	0	1	8	0	42	0	6.38	6.65	0.00
				n:		7	7	7	7	7	7	7	7	7	7	7	7
1	15	6	840415	30029	53	0	0	0	0	0	11	0	0	0	6	0	0
2		6	840810	30506	53	0	0	0	0	0	2	0	0	0	3	0	0
3		6	841107	36204	53	0	0	0	0	0	9	0	0	11	0	0	0
5		6	850302	10166	53	0	0	0	0	0	13	0	0	0	0	0	0
6		6	850314	10183	53	0	0	0	0	0	0	0	0	0	0	0	0
7		6	850704	10117	53	0	0	0	0	0	0	0	0	0	0	0	0
9		6	851113	16475	53	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0	0	0	0	0	5	0	0	2	1.29	0.00	0.00
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	0	0	0	0	13	0	0	11	6.00	0.00	0.00
				STD. DEV.:		0	0	0	0	0	5	0	0	4	2.19	0.00	0.00
				n:		7	7	7	7	7	7	7	7	7	7	7	7
1		7	840419	30034	53	0	0	0	0	0	5	0	10	0	0	0	0
2		7	840809	30503	53	0	0	0	0	0	0	0	6	0	0	0	0
3		7	841106	36202	53	0	0	0	0	0	4	0	0	11	0	0	5
3		7	841106	36203	57	0	0	0	0	0	9	0	6	43	0	0	1
5		7	850301	10164	53	0	0	0	0	0	18	0	0	0	0	0	3
6		7	850315	10184	53	0	15	40	0	0	0	0	0	0	0	0	0
7		7	850703	10116	53												
8		7	850912	16307	53	0	0	0	0	0	0	0	0	0	3	0	0
9		7	851116	16482	53	0	4	0	0	0	19	81	0	27	26	37	18

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSUPHAN I ng/g	ENDOSUPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
				MEAN:		0	2	5	0	0	7	10	3	10	3.63	4.63	3.38
				MIN:		0	0	0	0	0	0	0	0	0	0.00	0.00	0.00
				MAX:		0	15	40	0	0	19	81	10	43	26.00	37.00	18.00
				STD. DEV.:		0	5	13	0	0	7	27	4	15	8.51	12.24	5.79
				n:		8	8	8	8	8	8	8	8	8	8	8	8

1984-1985 TRIBUTARY SURVEY
SUSPENDED SEDIMENTS--HERBICIDES

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMETRYNE ng/g	ATRAZINE ng/g	BLADEX ng/g	PROMETONE ng/g	PROPAZINE ng/g	PROMETRYNE ng/g	SENCOR ng/g	SIMAZINE	DICAMBA	PICLORAM	SILVEX	2,4-DICHLORO-PHENOXYACETIC ACID ng/g	2,4-DICHLORO-PHENOXYBUTYRIC ACID ng/g	2,4,5-TRICHLORO PHENOXYACETIC ACID ng/g
1	4	1	840414	30026	53														
1		1	840414	30027	57														
2		1	840817	30508	53														
2		1	840817	30509	57														
3		1	841114	36207	53														
3		1	841114	36208	57														
5		1	850305	10168	53														
5		1	850305	10169	57														
6		1	850322	10195	53														
6		1	850322	10196	57														
7		1	850707	10121	53														
7		1	850707	10122	57									0	0	0	0	0	50
9		1	851117	16486	53	0	0	0	0	0	0	0	0						
9		1	851117	16487	57	0	0	0	0	0	0	0	0						
				MEAN:		0	0	0	0	0	0	0	0	0	0	0	0	0	50
				MIN:		0	0	0	0	0	0	0	0	0	0	0	0	0	50
				MAX:		0	0	0	0	0	0	0	0	0	0	0	0	0	50
				STD. DEV.:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				n:		2	2	2	2	2	2	2	2	1	1	1	1	1	1
1		2	840415	30028	53														
2		2	840810	30505	53														
5		2	850303	10167	53														
6		2	850316	10188	53														
6		2	850316	10189	57														
7		2	850706	10120	53														
8		2	850825	16289	53	0	0	0	0	0	0	0	0						
8		2	850825	16290	57	0	0	0	0	0	0	0	0	0	600	200	0	0	200
8		2	850908	16300	53	0	0	0	0	0	0	0	0						
8		2	850908	16301	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMETRYNE ng/g	ATRAZINE ng/g	BLADEX ng/g	PROMETONE ng/g	PROPAZINE ng/g	PROMETRYNE ng/g	SENCOR ng/g	SIMAZINE	DICAMBA	PICLORAM	SILVEX	2,4-DICHLORO-PHENOXYACETIC ACID ng/g	2,4-DICHLORO-PHENOXYBUTYRIC ACID ng/g	2,4,5-TRICHLORO PHENOXYACETIC ACID ng/g
9	4	2	851115	16479	53	0	0	0	0	0	0	0	0						
9		2	851115	16480	57	0	0	0	0	0	0	0	0						
				MEAN:		0	0	0	0	0	0	0	0	0	300	100	0	0	100
				MIN:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				MAX:		0	0	0	0	0	0	0	0	0	600	200	0	0	200
				STD. DEV.:		0	0	0	0	0	0	0	0	0	300	100	0	0	100
				n:		6	6	6	6	6	6	6	6	2	2	2	2	2	2
1		3	840409	30025	53														
2		3	840827	30510	53														
3		3	841115	36209	53														
5		3	850306	10170	53														
6		3	850319	10191	53														
7		3	850707	10123	53									0	0	0	0	0	0
9		3	851118	16488	53	0	250	0	0	0	0	0	0						
				MEAN:		0	250	0	0	0	0	0	0	0	0	0	0	0	0
				MIN:		0	250	0	0	0	0	0	0	0	0	0	0	0	0
				MAX:		0	250	0	0	0	0	0	0	0	0	0	0	0	0
				STD. DEV.:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1	1
1		4	840408	30024	53														
2		4	840828	30511	53														
3		4	841116	36210	53														
5		4	850308	10172	53														
6		4	850320	10193	53														
7		4	850708	10124	53									0	0	0	0	0	50
9		4	851118	16489	53	0	0	0	0	0	0	0	0						

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMETRYNE ng/g	ATRAZINE ng/g	BLADEX ng/g	PROMETONE ng/g	PROPAZINE ng/g	PROMETRYNE ng/g	SENCOR ng/g	SIMAZINE	DICAMBA	PICLORAM	SILVEX	2,4-DICHLORO-PHENOXYACETIC ACID ng/g	2,4-DICHLORO-PHENOXYBUTYRIC ACID ng/g	2,4,5-TRICHLORO-PHENOXYACETIC ACID ng/g
				MEAN:		0	0	0	0	0	0	0	0	0	0	0	0	0	50
				MIN:		0	0	0	0	0	0	0	0	0	0	0	0	0	50
				MAX:		0	0	0	0	0	0	0	0	0	0	0	0	0	50
				STD. DEV.:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	8	6	850228	10162	53														
6		6	850313	10180	53														
7		6	850701	10112	53	0	0	0	0	0	0	0	0	0	0	0	0	0	50
8		6	850823	16287	53	0	0	0	0	0	0	0	0	0	0	400	0	0	0
9		6	851111	16474	53	0	0	0	0	0	0	0	0						
				MEAN:		0	0	0	0	0	0	0	0	0	0	200	0	0	25
				MIN:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				MAX:		0	0	0	0	0	0	0	0	0	0	400	0	0	50
				STD. DEV.:		0	0	0	0	0	0	0	0	0	0	200	0	0	25
				n:		3	3	3	3	3	3	3	3	2	2	2	2	2	2
1	10	5	840408	30023	53														
2		5	840816	30507	57														
3		5	841116	36211	53														
5		5	850309	10174	53														
6		5	850320	10194	53														
7		5	850708	10125	53														
8		5	850908	16299	53	0	0	0	0	0	0	0	0						
9		5	851119	16490	53	0	0	0	0	0	0	0	0	0	120	0	100	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMETRYNE ng/g	ATRAZINE ng/g	BLADEX ng/g	PROMETONE ng/g	PROPAZINE ng/g	PROMETRYNE ng/g	SENCOR ng/g	SIMAZINE	DICAMBA	PICLORAM	SILVEX	2,4-DICHLORO-PHENOXYACETIC ACID ng/g	2,4-DICHLORO-PHENOXYBUTYRIC ACID ng/g	2,4,5-TRICHLORO PHENOXYACETIC ACID ng/g
				MEAN:		0	0	0	0	0	0	0	0	0	120	0	100	0	0
				MIN:		0	0	0	0	0	0	0	0	0	120	0	100	0	0
				MAX:		0	0	0	0	0	0	0	0	0	120	0	100	0	0
				STD. DEV.:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				n:		2	2	2	2	2	2	2	2	1	1	1	1	1	1
1	10	6	840407	30022	53														
2		6	840828	30512	53														
3		6	841117	36212	53														
6		6	850317	10190	53														
7		6	850709	10126	53														
8		6	850907	16297	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9		6	851119	16491	53	0	0	0	0	0	0	0	0						
				MEAN:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				MIN:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				MAX:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				STD. DEV.:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				n:		2	2	2	2	2	2	2	2	1	1	1	1	1	1
1		7	840405	30020	53														
2		7	840829	30513	53														
3		7	841119	36213	53														
5		7	850309	10173	53														
6		7	850319	10192	53														
7		7	850709	10127	53									0	0	0	250	0	0
8		7	850907	16298	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9		7	851120	16492	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMETRYNE ng/g	ATRAZINE ng/g	BLADEX ng/g	PROMETONE ng/g	PROPAZINE ng/g	PROMETRYNE ng/g	SENCOR ng/g	SIMAZINE	DICAMBA	PICLORAM	SILVEX	2,4-DICHLORO-PHENOXYACETIC ACID ng/g	2,4-DICHLORO-PHENOXYBUTYRIC ACID ng/g	2,4,5-TRICHLORO PHENOXYACETIC ACID ng/g
				MEAN:		0	0	0	0	0	0	0	0	0	0	0	83	0	0
				MIN:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				MAX:		0	0	0	0	0	0	0	0	0	0	0	250	0	0
				STD. DEV.:		0	0	0	0	0	0	0	0	0	0	0	118	0	0
				n:		2	2	2	2	2	2	2	2	3	3	3	3	3	3
1	10	8	840406	30021	53														
				MEAN:															
				MIN:															
				MAX:															
				STD. DEV.:															
				n:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	15	3	840418	30031	53														
1		3	840418	30032	57														
2		3	840808	30501	53														
2		3	840808	30502	57														
3		3	841105	36201	53														
5		3	850227	10160	53														
5		3	850227	10161	57														
6		3	850311	10175	53														
6		3	850311	10176	57														
7		3	850702	10114	53	0	0	0	0	0	0	0	0						
8		3	850822	16285	53	0	0	0	0	0	0	0	0						
8		3	850822	16286	57	0	0	0	0	0	0	0	0						
9		3	851114	16477	53	0	0	0	0	0	0	0	0						
9		3	851114	16478	57	0	0	0	0	0	0	0	0						

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMETRYNE ng/g	ATRAZINE ng/g	BLADEX ng/g	PROMETONE ng/g	PROPAZINE ng/g	PROMETRYNE ng/g	SENCOR ng/g	SIMAZINE	DICAMBA	PICLORAM	SILVEX	2,4-DICHLORO-PHENOXYACETIC ACID ng/g	2,4-DICHLORO-PHENOXYBUTYRIC ACID ng/g	2,4,5-TRIC PHENOXYACI ACID ng/g
				MEAN:		0	0	0	0	0	0	0	0						
				MIN:		0	0	0	0	0	0	0	0						
				MAX:		0	0	0	0	0	0	0	0						
				STD. DEV.:		0	0	0	0	0	0	0	0						
				n:		5	5	5	5	5	5	5	5	0	0	0	0	0	0
1	15	4	840619	30033	53														
2		4	840809	30504	53														
3		4	841105	36200	53														
5		4	850228	10163	53														
6		4	850313	10181	53														
7		4	850701	10113	53	0	0	0	0	0	0	0	0						
8		4	850823	16288	53	0	0	0	0	0	0	0	0						
9		4	851113	16476	53	0	0	0	0	0	0	0	0	0	0	0	0	0	100
				MEAN:		0	0	0	0	0	0	0	0	0	0	0	0	0	100
				MIN:		0	0	0	0	0	0	0	0	0	0	0	0	0	100
				MAX:		0	0	0	0	0	0	0	0	0	0	0	0	0	100
				STD. DEV.:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				n:		3	3	3	3	3	3	3	3	1	1	1	1	1	1
1		5	840416	30030	53														
2		5	840807	30500	53														
3		5	841107	36205	53														
5		5	850302	10165	53														
6		5	850314	10182	53														
7		5	850704	10118	53	0	0	0	0	0	0	0	0						
9		5	851115	16481	53	0	0	0	0	0	0	0	0						

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMETRYNE mg/g	ATRAZINE mg/g	BLADEX mg/g	PROMETONE mg/g	PROPAZINE mg/g	PROMETRYNE mg/g	SENCOR mg/g	SIMAZINE	DICAMBA	PICLORAM	SILVEX	2,4-DICHLORO-PHENOXYACETIC ACID mg/g	2,4-DICHLORO-PHENOXYBUTYRIC ACID mg/g	2,4,5-TRICHLOR PHENOXYACETIC ACID mg/g
				MEAN:		0	0	0	0	0	0	0	0						
				MIN:		0	0	0	0	0	0	0	0						
				MAX:		0	0	0	0	0	0	0	0						
				STD. DEV.:		0	0	0	0	0	0	0	0						
				n:		2	2	2	2	2	2	2	2	0	0	0	0	0	0
1	15	6	840415	30029	53														
2		6	840810	30506	53														
3		6	841107	36204	53														
5		6	850302	10166	53														
6		6	850316	10183	53														
7		6	850704	10117	53	0	0	0	0	0	0	0	0						
9		6	851113	16475	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				MIN:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				MAX:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				STD. DEV.:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				n:		2	2	2	2	2	2	2	2	1	1	1	1	1	1
1		7	840419	30036	53														
2		7	840809	30503	53														
3		7	841106	36202	53														
3		7	841106	36203	57														
5		7	850301	10164	53														
6		7	850315	10184	53														
7		7	850703	10116	53	0	0	0	0	0	0	4401	0	0	0	0	0	0	0
8		7	850912	16307	53	0	0	0	0	0	0	0	0						
9		7	851116	16482	53	0	120	0	0	0	0	0	0						

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMETRYNE ng/g	ATRAZINE ng/g	BLADEX ng/g	PROMETONE ng/g	PROPAZINE ng/g	PROMETRYNE ng/g	SENCOR ng/g	SIMAZINE	DICAMBA	PICLORAM	SILVEX	2,4-DICHLORO-PHENOXYACETIC ACID ng/g	2,4-DICHLORO-PHENOXYBUTYRIC ACID ng/g	2,4,5-TRICHLORO PHENOXYACETIC ACID ng/g
				MEAN:		0	40	0	0	0	0	2200	0	0	0	0	0	0	0
				MIN:		0	0	0	0	0	0	0	0	0	0	0	0	0	0
				MAX:		0	120	0	0	0	0	6601	0	0	0	0	0	0	0
				STD. DEV.:		0	57	0	0	0	0	3112	0	0	0	0	0	0	0
				n:		3	3	3	3	3	3	3	3	1	1	1	1	1	1

1984-1985 TRIBUTARY SURVEY

SUSPENDED SEDIMENTS--CHLORINATED AROMATICS

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEXACHLORO-BENZENE ng/g	OCTACHLORO-STYRENE ng/g	PCBs ng/g
1	4	1	840414	30026	53	0	0	0
1		1	840414	30027	57	0	0	0
2		1	840817	30508	53	1	0	0
2		1	840817	30509	57	1	0	0
3		1	841114	36207	53	0	0	25
3		1	841114	36208	57	0	0	0
5		1	850305	10168	53	2	0	61190
5		1	850305	10169	57	1	0	0
6		1	850322	10195	53	0		0
6		1	850322	10196	57	0		0
7		1	850707	10121	53	0		0
7		1	850707	10122	57	0		0
9		1	851117	16486	53	0		0
9		1	851117	16487	57	0		30
				MEAN:		0.4	0.0	4374.6
				MIN:		0.0	0.0	0.0
				MAX:		2.0	0.0	61190.0
				STD. DEV.:		0.6	0.0	15757.7
				n:		14	8	14
1		2	840415	30028	53	3	2	0
2		2	840810	30505	53	3	4	0
5		2	850303	10167	53	31	24	60
6		2	850316	10188	53	0		0
6		2	850316	10189	57	0		55
7		2	850706	10120	53	0		0
8		2	850825	16289	53	6		0
8		2	850825	16290	57	20		0
8		2	850908	16300	53	1		0
8		2	850908	16301	57	2		0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEXACHLORO-BENZENE ng/g	OCTACHLORO-STYRENE ng/g	PCBs ng/g
9	4	2	851115	16479	53	0		0
9		2	851115	16480	57	0		0
				MEAN:		5.5	10.0	9.6
				MIN:		0.0	2.0	0.0
				MAX:		31.0	24.0	60.0
				STD. DEV.:		9.4	9.9	21.5
				n:		12	3	12
1		3	840409	30025	53	0	0	0
2		3	840827	30510	53	0	0	0
3		3	841115	36209	53	0	1	370
5		3	850306	10170	53	1	0	1560
6		3	850319	10191	53	1		35
7		3	850707	10123	53	0		0
9		3	851118	16488	53	0		0
				MEAN:		0.3	0.3	280.7
				MIN:		0.0	0.0	0.0
				MAX:		1.0	1.0	1560.0
				STD. DEV.:		0.5	0.4	537.2
				n:		7	4	7
1		4	840408	30024	53	0	0	0
2		4	840828	30511	53	0	5	0
3		4	841116	36210	53	0	0	0
5		4	850308	10172	53	0	0	0
6		4	850320	10193	53	0		0
7		4	850708	10124	53	0		0
9		4	851118	16489	53	0		0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEXACHLORO-BENZENE ng/g	OCTACHLORO-STYRENE ng/g	PCBs ng/g
				MEAN:		0.0	1.3	0.0
				MIN:		0.0	0.0	0.0
				MAX:		0.0	5.0	0.0
				STD. DEV.:		0.0	2.2	0.0
				n:		7	4	7
5	8	6	850228	10162	53	0	0	130
6		6	850313	10180	53	0		335
7		6	850701	10112	53	0		0
8		6	850823	16287	53	0		0
9		6	851111	16474	53	0		0
				MEAN:		0.0	0.0	93.0
				MIN:		0.0	0.0	0.0
				MAX:		0.0	0.0	335.0
				STD. DEV.:		0.0	0.0	131.1
				n:		5	1	5
1	10	5	840408	30023	53	2	1	0
2		5	840816	30507	57	7	9	35
3		5	841116	36211	53	10	0	35
5		5	850309	10174	53	0	0	90
6		5	850320	10194	53	0		40
7		5	850708	10125	53			
8		5	850908	16299	53	2		0
9		5	851119	16490	53	0		75

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEXACHLORO-BENZENE ng/g	OCTACHLORO-STYRENE ng/g	PCBs ng/g
				MEAN:		3.0	2.5	39.3
				MIN:		0.0	0.0	0.0
				MAX:		10.0	9.0	90.0
				STD. DEV.:		3.7	3.8	31.6
				n:		7	4	7
1	10	6	840407	30022	53	1	0	125
2		6	840828	30512	53	1	0	435
3		6	841117	36212	53	2	0	25
6		6	850317	10190	53	5		400
7		6	850709	10126	53			
8		6	850907	16297	53	3		460
9		6	851119	16491	53	0		350
				MEAN:		2.0	0.0	299.2
				MIN:		0.0	0.0	25.0
				MAX:		5.0	0.0	460.0
				STD. DEV.:		1.6	0.0	164.6
				n:		6	3	6
1		7	840405	30020	53	0	0	0
2		7	840829	30513	53	0	0	0
3		7	841119	36213	53	0	0	0
5		7	850309	10173	53	0	0	11760
6		7	850319	10192	53	0		0
7		7	850709	10127	53			
8		7	850907	16298	53	52		0
9		7	851120	16492	53	0		0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEXACHLORO-BENZENE ng/g	OCTACHLORO-STYRENE ng/g	PCBs ng/g
				MEAN:		7.4	0.0	1680.0
				MIN:		0.0	0.0	0.0
				MAX:		52.0	0.0	11760.0
				STD. DEV.:		18.2	0.0	4115.1
				n:		7	4	7
1	10	8	840406	30021	53	0	0	0
				MEAN:		0.0	0.0	0.0
				MIN:		0.0	0.0	0.0
				MAX:		0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0
				n:		1	1	1
1	15	3	840418	30031	53	145	41	0
1		3	840418	30032	57	147	45	55
2		3	840808	30501	53	74	12	0
2		3	840808	30502	57	95	15	0
3		3	841105	36201	53	27	6	0
5		3	850227	10160	53	54	10	40
5		3	850227	10161	57	1	16	2165
6		3	850311	10175	53	38	0	77840
6		3	850311	10176	57	0	11	65
7		3	850702	10114	53	920		0
8		3	850822	16285	53	151		0
8		3	850822	16286	57	130		0
9		3	851114	16477	53	5		0
9		3	851114	16478	57	17		0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEXACHLORO-BENZENE ng/g	OCTACHLORO-STYRENE ng/g	PCBs ng/g
				MEAN:		128.9	17.3	5726.1
				MIN:		0.0	0.0	0.0
				MAX:		920.0	45.0	77840.0
				STD. DEV.:		226.2	14.5	20008.4
				n:		14	9	14
1	15	4	840419	30033	53			
2		4	840809	30504	53	13	7	35
3		4	841105	36200	53	0		0
5		4	850228	10163	53	7	0	140
6		4	850313	10181	53	0		65
7		4	850701	10113	53	14		25
8		4	850823	16288	53	9		0
9		4	851113	16476	53	0		0
				MEAN:		6.1	3.5	37.9
				MIN:		0.0	0.0	0.0
				MAX:		14.0	7.0	140.0
				STD. DEV.:		5.7	3.5	47.3
				n:		7	2	7
1		5	840416	30030	53	1	0	0
2		5	840807	30500	53	0	0	0
3		5	841107	36205	53	0	0	0
5		5	850302	10165	53	9	8	0
6		5	850314	10182	53	0		80
7		5	850704	10118	53	1		0
9		5	851115	16481	53	0		0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEXACHLORO-BENZENE ng/g	OCTACHLORO-STYRENE ng/g	PCBs ng/g
				MEAN:		1.6	2.0	11.4
				MIN:		0.0	0.0	0.0
				MAX:		9.0	8.0	80.0
				STD. DEV.:		3.1	3.5	28.0
				n:		7	4	7
1	15	6	840415	30029	53	2	0	25
2		6	840810	30506	53	6	7	0
3		6	841107	36204	53	4	0	0
5		6	850302	10166	53	0	0	0
6		6	850314	10183	53	0		50
7		6	850704	10117	53	3		0
9		6	851113	16475	53	5		0
				MEAN:		2.9	1.8	10.7
				MIN:		0.0	0.0	0.0
				MAX:		6.0	7.0	50.0
				STD. DEV.:		2.2	3.0	18.2
				n:		7	4	7
1		7	840419	30034	53	0	0	1805
2		7	840809	30503	53	0	0	0
3		7	841106	36202	53	177	168	25
3		7	841106	36203	57	259	242	0
5		7	850301	10164	53	5854	5380	0
6		7	850315	10184	53	816		60
7		7	850703	10116	53			
8		7	850912	16307	53	44		
9		7	851116	16482	53	100		685

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEXACHLORO-BENZENE ng/g	OCTACHLORO-STYRENE ng/g	PCBs ng/g
				MEAN:		906.3	1158.0	367.9
				MIN:		0.0	0.0	0.0
				MAX:		5854.0	5380.0	1805.0
				STD. DEV.:		1886.6	2113.1	630.7
				n:		8	5	7

BOTTOM SEDIMENT RESULTS

1984-1985 TRIBUTARY SURVEY
BOTTOM SEDIMENTS--METALS

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
4	4	1	841125	36258	51		4.26	0.69	10	35	26	20000	20.00	0.060		22		74.00
9		1	851117	16534	51	5000	4.90	0.20	5	11	18	8700	16.00	0.010	180	8	0	30.00
9		1	851117	16535	56	4800	4.60	0.20	5	11	12	7700	6.90	0.010	190	8	0	25.00
				MEAN:		4900	4.59	0.36	6	19	19	12133	14.30	0.027	185	13	0	43.00
				MIN:		4800	4.26	0.20	5	11	12	7700	6.90	0.010	180	8	0	25.00
				MAX:		5000	4.90	0.69	10	35	26	20000	20.00	0.060	190	22	0	74.00
				STD. DEV.:		100	0.26	0.23	2	11	6	5578	5.48	0.024	5	6	0	22.02
				n:		2	3	3	3	3	3	3	3	3	2	3	2	3
4		2	841125	36259	51		4.01	0.53	8	60	50	17000	19.00	0.110		28		84.00
9		2	851115	16530	51	12000	4.70	0.20	11	52	39	16000	19.00	0.040	330	32	0	74.00
9		2	851115	16531	56	12000	5.82	0.20	11	46	43	17000	15.00	0.020	340	30	0	79.00
				MEAN:		12000	4.84	0.31	10	53	44	16667	17.67	0.057	335	30	0	79.00
				MIN:		12000	4.01	0.20	8	46	39	16000	15.00	0.020	330	28	0	74.00
				MAX:		12000	5.82	0.53	11	60	50	17000	19.00	0.110	340	32	0	84.00
				STD. DEV.:		0	0.75	0.16	1	6	5	471	1.89	0.039	5	2	0	4.08
				n:		2	3	3	3	3	3	3	3	3	2	3	2	3
3		3	841115	36253	51		1.43	0.38	7	14	11	11000	38.00	0.020		11		48.00
9		3	851118	16536	51	9000	5.75	0.20	10	17	19	14000	12.00	0.020	250	16	0	55.00
				MEAN:		9000	3.59	0.29	8	16	15	12500	25.00	0.020	250	14	0	51.50
				MIN:		9000	1.43	0.20	7	14	11	11000	12.00	0.020	250	11	0	48.00
				MAX:		9000	5.75	0.38	10	17	19	14000	38.00	0.020	250	16	0	55.00
				STD. DEV.:		0	2.16	0.09	2	2	4	1500	13.00	0.000	0	3	0	3.50
				n:		1	2	2	2	2	2	2	2	2	1	2	1	2

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
3	4	4	841116	36254	51		1.94	0.49	7	22	13	16000	18.00	0.030		14		61.00
9		4	851118	16537	51	14000	7.66	0.20	11	26	22	18000	15.00	0.020	280	21	1	67.00
				MEAN:		14000	4.80	0.35	9	24	18	17000	16.50	0.025	280	18	1	64.00
				MIN:		14000	1.94	0.20	7	22	13	16000	15.00	0.020	280	14	1	61.00
				MAX:		14000	7.66	0.49	11	26	22	18000	18.00	0.030	280	21	1	67.00
				STD. DEV.:		0	2.86	0.15	2	2	5	1000	1.50	0.005	0	4	0	3.00
				n:		1	2	2	2	2	2	2	2	2	1	2	1	2
9	8	6	851111	16526	51	5200	2.20	0.20	5	14	13	7700	6.10	0.010	200	9	0	20.00
				MEAN:		5200	2.20	0.20	5	14	13	7700	6.10	0.010	200	9	0	20.00
				MIN:		5200	2.20	0.20	5	14	13	7700	6.10	0.010	200	9	0	20.00
				MAX:		5200	2.20	0.20	5	14	13	7700	6.10	0.010	200	9	0	20.00
				STD. DEV.:		0	0.00	0.00	0	0	0	0	0.00	0.000	0	0	0	0.00
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1
4	10	5	841125	36257	51		4.26	0.80	8	140	68	18000	250.00	0.110		230		190.00
9		5	851119	16538	51	13000	6.91	0.22	11	420	96	18000	70.00	2.400	230	540	1	320.00
				MEAN:		13000	5.59	0.51	10	280	82	18000	160.00	1.255	230	385	1	255.00
				MIN:		13000	4.26	0.22	8	140	68	18000	70.00	0.110	230	230	1	190.00
				MAX:		13000	6.91	0.80	11	420	96	18000	250.00	2.400	230	540	1	320.00
				STD. DEV.:		0	1.33	0.29	1	140	14	0	90.00	1.145	0	155	0	65.00
				n:		1	2	2	2	2	2	2	2	2	1	2	1	2
3		6	841117	36255	51		1.43	4.50	9	150	44	11000	90.00	0.130		87		340.00
9		6	851119	16539	51	11000	7.43	5.60	12	460	79	17000	150.00	0.210	250	260	1	600.00

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
				MEAN:		11000	4.43	5.05	10	305	62	14000	120.00	0.170	250	174	1	470.00
				MIN:		11000	1.43	4.50	9	150	44	11000	90.00	0.130	250	87	1	340.00
				MAX:		11000	7.43	5.60	12	460	79	17000	150.00	0.210	250	260	1	600.00
				STD. DEV.:		0	3.00	0.55	2	155	18	3000	30.00	0.040	0	87	0	130.00
				n:		1	2	2	2	2	2	2	2	2	1	2	1	2
3	10	7	841119	36256	51		4.87	0.90	12	52	28	38000	33.00	0.060		34		160.00
9		7	851120	16540	51	3000	2.85	0.20	4	8	7	6100	3.80	0.010	130	6	0	15.00
				MEAN:		3000	3.86	0.55	8	30	18	22050	18.40	0.035	130	20	0	87.50
				MIN:		3000	2.85	0.20	4	8	7	6100	3.80	0.010	130	6	0	15.00
				MAX:		3000	4.87	0.90	12	52	28	38000	33.00	0.060	130	34	0	160.00
				STD. DEV.:		0	1.01	0.35	4	22	10	15950	14.60	0.025	0	14	0	72.50
				n:		1	2	2	2	2	2	2	2	2	1	2	1	2
9	15	3	851114	16529	51	5600	5.04	0.20	10	52	33	10000	45.00	0.760	170	23	1	81.00
				MEAN:		5600	5.04	0.20	10	52	33	10000	45.00	0.760	170	23	1	81.00
				MIN:		5600	5.04	0.20	10	52	33	10000	45.00	0.760	170	23	1	81.00
				MAX:		5600	5.04	0.20	10	52	33	10000	45.00	0.760	170	23	1	81.00
				STD. DEV.:		0	0.00	0.00	0	0	0	0	0.00	0.000	0	0	0	0.00
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1
3		4	841105	36250	51		7.54	0.40	9	35	24	20000	20.00	0.220		22		90.00
9		4	851113	16528	51	17000	6.76	0.20	13	80	43	38000	18.00	0.070	380	30	0	47.00

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALUMINUM ug/g	ARSENIC ug/g	CADMIUM ug/g	COBALT ug/g	CHROMIUM ug/g	COPPER ug/g	IRON ug/g	LEAD ug/g	MERCURY ug/g	MANGANESE ug/g	NICKEL ug/g	SELENIUM ug/g	ZINC ug/g
				MEAN:		17000	7.15	0.30	11	58	34	29000	19.00	0.145	380	26	0	68.50
				MIN:		17000	6.76	0.20	9	35	24	20000	18.00	0.070	380	22	0	47.00
				MAX:		17000	7.54	0.40	13	80	43	38000	20.00	0.220	380	30	0	90.00
				STD. DEV.:		0	0.39	0.10	2	23	10	9000	1.00	0.075	0	4	0	21.50
				n:		1	2	2	2	2	2	2	2	2	1	2	1	2
3	15	5	841107	36252	51		4.90							0.030				
9		5	851115	16532	51	3600	6.25	0.58	13	33	18	10000	22.00	0.010	740	26	0	74.00
				MEAN:		3600	5.58	0.58	13	33	18	10000	22.00	0.020	740	26	0	74.00
				MIN:		3600	4.90	0.58	13	33	18	10000	22.00	0.010	740	26	0	74.00
				MAX:		3600	6.25	0.58	13	33	18	10000	22.00	0.030	740	26	0	74.00
				STD. DEV.:		0	0.68	0.00	0	0	0	0	0.00	0.010	0	0	0	0.00
				n:		1	2	1	1	1	1	1	1	2	1	1	1	1
3		6	841107	36251	51		3.22	0.20	6	61	14	11000	9.30	0.040		12		48.00
9		6	851113	16527	51	8600	4.13	0.20	9	49	14	14000	14.00	0.020	190	14	0	53.00
				MEAN:		8600	3.68	0.20	7	55	14	12500	11.65	0.030	190	13	0	50.50
				MIN:		8600	3.22	0.20	6	49	14	11000	9.30	0.020	190	12	0	48.00
				MAX:		8600	4.13	0.20	9	61	14	14000	14.00	0.040	190	14	0	53.00
				STD. DEV.:		0	0.46	0.00	1	6	0	1500	2.35	0.010	0	1	0	2.50
				n:		1	2	2	2	2	2	2	2	2	1	2	1	2

1984-1985 TRIBUTARY SURVEY
BOTTOM SEDIMENTS--PESTICIDES

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
4	4	1	841125	36258	51	0	0.00	0.00	0	0	2	0
9		1	851117	16534	51	0	0.00	0.00	0	0	0	0
9		1	851117	16535	56	0	0.00	0.00	0	0	0	0
				MEAN:		0	0.00	0.00	0	0	1	0
				MIN:		0	0.00	0.00	0	0	0	0
				MAX:		0	0.00	0.00	0	0	2	0
				STD. DEV.:	0		0.00	0.00	0	0	1	0
				n:		3	3	3	3	3	3	3
4		2	841125	36259	51	0	0.00	0.00	0	0	2	0
9		2	851115	16530	51	0	0.00	0.00	0	0	0	0
9		2	851115	16531	56	0	0.00	0.00	5	0	3	0
				MEAN:		0	0.00	0.00	2	0	2	0
				MIN:		0	0.00	0.00	0	0	0	0
				MAX:		0	0.00	0.00	5	0	3	0
				STD. DEV.:	0		0.00	0.00	2	0	1	0
				n:		3	3	3	3	3	3	3
3		3	841115	36253	51	0	0.00	0.00	0	0	2	0
9		3	851118	16536	51	0	0.00	0.00	0	0	2	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
				MEAN:		0	0.00	0.00	0	0	2	0
				MIN:		0	0.00	0.00	0	0	2	0
				MAX:		0	0.00	0.00	0	0	2	0
				STD. DEV.:		0	0.00	0.00	0	0	0	0
				n:		2	2	2	2	2	2	2
3	4	4	841116	36254	51	0	0.00	0.00	0	0	1	0
9		4	851118	16537	51	0	0.00	0.00	0	0	13	0
				MEAN:		0	0.00	0.00	0	0	7	0
				MIN:		0	0.00	0.00	0	0	1	0
				MAX:		0	0.00	0.00	0	0	13	0
				STD. DEV.:		0	0.00	0.00	0	0	6	0
				n:		2	2	2	2	2	2	2
9	8	6	851111	16526	51	0	0.00	0.00	0	0	0	0
				MEAN:		0	0.00	0.00	0	0	0	0
				MIN:		0	0.00	0.00	0	0	0	0
				MAX:		0	0.00	0.00	0	0	0	0
				STD. DEV.:		0	0.00	0.00	0	0	0	0
				n:		1	1	1	1	1	1	1
4	10	5	841125	36257	51	0	0.00	0.00	0	0	4	0
9		5	851119	16538	51	0	0.00	0.00	0	0	9	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
				MEAN:		0	0.00	0.00	0	0	7	0
				MIN:		0	0.00	0.00	0	0	4	0
				MAX:		0	0.00	0.00	0	0	9	0
				STD. DEV.:		0	0.00	0.00	0	0	3	0
				n:		2	2	2	2	2	2	2
3	10	6	841117	36255	51	1	0.00	0.00	0	15	0	5
9		6	851119	16539	51	0	0.00	0.00	0	20	36	0
				MEAN:		1	0.00	0.00	0	18	18	3
				MIN:		0	0.00	0.00	0	15	0	0
				MAX:		1	0.00	0.00	0	20	36	5
				STD. DEV.:		1	0.00	0.00	0	3	18	3
				n:		2	2	2	2	2	2	2
3		7	841119	36256	51	0	0.00	0.00	0	0	4	0
9		7	851120	16540	51	0	0.00	0.00	0	0	0	0
				MEAN:		0	0.00	0.00	0	0	2	0
				MIN:		0	0.00	0.00	0	0	0	0
				MAX:		0	0.00	0.00	0	0	4	0
				STD. DEV.:		0	0.00	0.00	0	0	2	0
				n:		2	2	2	2	2	2	2
9	15	3	851116	16529	51	0	0.00	24.00	0	0	3	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
				MEAN:		0	0.00	24.00	0	0	3	0
				MIN:		0	0.00	24.00	0	0	3	0
				MAX:		0	0.00	24.00	0	0	3	0
				STD. DEV.:		0	0.00	0.00	0	0	0	0
				n:		1	1	1	1	1	1	1
3	15	4	841105	36250	51	0	0.00	0.00	0	0	0	0
9		4	851113	16528	51	0	0.00	0.00	0	0	0	0
				MEAN:		0	0.00	0.00	0	0	0	0
				MIN:		0	0.00	0.00	0	0	0	0
				MAX:		0	0.00	0.00	0	0	0	0
				STD. DEV.:		0	0.00	0.00	0	0	0	0
				n:		2	2	2	2	2	2	2
3		5	841107	36252	51	0	0.00	0.00	0	0	0	0
9		5	851115	16532	51	0	0.00	0.00	0	0	0	0
				MEAN:		0	0.00	0.00	0	0	0	0
				MIN:		0	0.00	0.00	0	0	0	0
				MAX:		0	0.00	0.00	0	0	0	0
				STD. DEV.:		0	0.00	0.00	0	0	0	0
				n:		2	2	2	2	2	2	2
3		6	841107	36251	51	0	0.00	0.00	0	0	0	0
9		6	851113	16527	51	0	0.00	0.00	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEPTACHLOR ng/g	MIREX ng/g	OXYCHLOR-DANE ng/g	OP-DDT ng/g	PP-DDD ng/g	PP-DDE ng/g	PP-DDT ng/g
				MEAN:		0	0.00	0.00	0	0	0	0
				MIN:		0	0.00	0.00	0	0	0	0
				MAX:		0	0.00	0.00	0	0	0	0
				STD. DEV.:	0		0.00	0.00	0	0	0	0
				n:		2	2	2	2	2	2	2

1984-1985 TRIBUTARY SURVEY
BOTTOM SEDIMENTS--PESTICIDES

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSULPHAN I ng/g	ENDOSULPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
4	4	1	841125	36258	51	0	0	0	0	0	0	0	0	0	0	0	0
9		1	851117	16534	51	0	0	0	0	0	0	0	0	0	0	0	0
9		1	851117	16535	56	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				n:		3	3	3	3	3	3	3	3	3	3	3	3
4		2	841125	36259	51	0	0	0	0	0	0	0	0	0	0	0	0
9		2	851115	16530	51	0	0	0	0	0	0	0	0	0	0	0	0
9		2	851115	16531	56	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				n:		3	3	3	3	3	3	3	3	3	3	3	3
3		3	841115	36253	51	0	0	0	0	0	0	0	0	0	0	0	0
9		3	851118	16536	51	0	0	0	0	0	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSULPHAN I ng/g	ENDOSULPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
				MEAN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				n:		2	2	2	2	2	2	2	2	2	2	2	2
3	4	4	841116	36254	51	0	0	0	0	0	0	0	0	0	0	0	0
9		4	851118	16537	51	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				n:		2	2	2	2	2	2	2	2	2	2	2	2
9	8	6	851111	16526	51	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				n:		1	1	1	1	1	1	1	1	1	1	1	1
4	10	5	841125	36257 *	51	0	0	0	3	4	0	0	0	4	0	0	0
9		5	851119	16538	51	0	0	0	7	9	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSULPHAN I ng/g	ENDOSULPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
				MEAN:		0.0	0.0	0.0	5.0	6.5	0.0	0.0	0.0	2.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	3.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0	7.0	9.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0	2.0	2.5	0.0	0.0	0.0	2.0	0.0	0.0	0.0
				n:		2	2	2	2	2	2	2	2	2	2	2	2
3	10	6	841117	36255	51	0	0	0	6	8	15	19	7	0	15	0	0
9		6	851119	16539	51	0	0	0	10	10	28	86	42	18	13	12	14
				MEAN:		0.0	0.0	0.0	8.0	9.0	21.5	52.5	24.5	9.0	14.0	6.0	7.0
				MIN:		0.0	0.0	0.0	6.0	8.0	15.0	19.0	7.0	0.0	13.0	0.0	0.0
				MAX:		0.0	0.0	0.0	10.0	10.0	28.0	86.0	42.0	18.0	15.0	12.0	14.0
				STD. DEV.:		0.0	0.0	0.0	2.0	1.0	6.5	33.5	17.5	9.0	1.0	6.0	7.0
				n:		2	2	2	2	2	2	2	2	2	2	2	2
3		7	841119	36256	51	0	0	0	0	0	55	0	0	0	0	0	0
9		7	851120	16540	51	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0.0	0.0	0.0	0.0	0.0	27.5	0.0	0.0	0.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0	0.0	0.0	55.0	0.0	0.0	0.0	0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0	0.0	0.0	27.5	0.0	0.0	0.0	0.0	0.0	0.0
				n:		2	2	2	2	2	2	2	2	2	2	2	2
9	15	3	851114	16529	51	0	0	0	0	0	0	6	0	0	5	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSULPHAN I ng/g	ENDOSULPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
				MEAN:		0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	5.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	5.0	0.0	0.0
				MAX:		0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	5.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				n:		1	1	1	1	1	1	1	1	1	1	1	1
3	15	4	841105	36250	51	0	0	0	0	0	0	0	0	6	0	0	0
9		4	851113	16528	51	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0
				n:		2	2	2	2	2	2	2	2	2	2	2	2
3		5	841107	36252	51	0	0	0	0	0	0	0	0	0	0	0	0
9		5	851115	16532	51	0	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				n:		2	2	2	2	2	2	2	2	2	2	2	2
3		6	841107	36251	51	0	0	0	0	0	0	0	0	0	0	0	0
9		6	851113	16527	51	0	0	0	0	0	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	ALDRIN ng/g	a-BHC ng/g	b-BHC ng/g	a-CHLORDANE ng/g	g-CHLORDANE ng/g	DIELDRIN ng/g	METHOXYCHLOR ng/g	ENDRIN ng/g	ENDOSULPHAN SULPHATE ng/g	ENDOSULPHAN I ng/g	ENDOSULPHAN II ng/g	HEPTACHLOR EPOXIDE ng/g
				MEAN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MIN:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				MAX:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				STD. DEV.:		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				n:		2	2	2	2	2	2	2	2	2	2	2	2

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMETRYNE ng/g	ATRAZINE ng/g	BLADEX ng/g	PROMETONE ng/g	PROPAZINE ng/g	PROMETRYNE ng/g	SENCOR ng/g	SIMAZINE ng/g	DICAMBA ng/g	PICLORAM ng/g	SILVEX ng/g	2,4-DICHLORO PHENOXYACETIC ACID ng/g	2,4 DICHLORO-PHENOXYBUTYRIC ACID ng/g	2,4,5 PHENO ACID
				MEAN:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				MIN:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				MAX:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				STD. DEV.:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1	
3	4	4	841116	36254	51														
9		4	851118	16537	51	0	0.00	0.00	0	0	0	0	0	0	0	0	30	0	
				MEAN:		0	0.00	0.00	0	0	0	0	0	0	0	0	30	0	
				MIN:		0	0.00	0.00	0	0	0	0	0	0	0	0	30	0	
				MAX:		0	0.00	0.00	0	0	0	0	0	0	0	0	30	0	
				STD. DEV.:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	8	6	851111	16526	51	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				MEAN:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				MIN:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				MAX:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				STD. DEV.:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	10	5	841125	36257	51														
9		5	851119	16538	51	0	0.00	0.00	0	0	0	0	0	0	0	0	100	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMETRYNE ng/g	ATRAZINE ng/g	BLADEX ng/g	PROMETONE ng/g	PROPAZINE ng/g	PROMETRYNE ng/g	SENCOR ng/g	SIMAZINE ng/g	DICAMBA ng/g	PICLORAM ng/g	SILVEX ng/g	2,4-DICHLORO-PHENOXYACETIC ACID ng/g	2,4-DICHLORO-PHENOXYBUTYRIC ACID ng/g	2,4,5 PHENO ACID
				MEAN:		0	0.00	0.00	0	0	0	0	0	0	0	0	100	0	
				MIN:		0	0.00	0.00	0	0	0	0	0	0	0	0	100	0	
				MAX:		0	0.00	0.00	0	0	0	0	0	0	0	0	100	0	
				STD. DEV.:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1	
3	10	6	841117	36255	51														
9		6	851119	16539	51	0	0.00	0.00	0	0	0	0	0	0	0	0	100	0	
				MEAN:		0	0.00	0.00	0	0	0	0	0	0	0	0	100	0	
				MIN:		0	0.00	0.00	0	0	0	0	0	0	0	0	100	0	
				MAX:		0	0.00	0.00	0	0	0	0	0	0	0	0	100	0	
				STD. DEV.:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1	
3		7	841119	36256	51														
9		7	851120	16540	51	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				MEAN:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				MIN:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				MAX:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				STD. DEV.:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1	
9	15	3	851114	16529	51	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMETRYNE mg/g	ATRAZINE mg/g	BLADEX mg/g	PROMETONE mg/g	PROPAZINE mg/g	PROMETRYNE mg/g	SENCOR mg/g	SIMAZINE mg/g	DICAMBA mg/g	PICLORAM mg/g	SILVEX mg/g	2,4-DICHLORO-PHENOXYACETIC ACID mg/g	2,4 DICHLORO-PHENOXYBUTYRIC ACID mg/g	2,4,5-PHENOX ACID m
				MEAN:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				MIN:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				MAX:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				STD. DEV.:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	15	4	841105	36250	51														
9		4	851113	16528	51	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				MIN:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				MAX:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				STD. DEV.:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1	1
3		5	841107	36252	51														
9		5	851115	16532	51	0	200.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				MEAN:		0	200.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				MIN:		0	200.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				MAX:		0	200.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				STD. DEV.:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1	1
3		6	841107	36251	51														
9		6	851113	16527	51	0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	AMETRYNE mg/g	ATRAZINE mg/g	BLADEX mg/g	PROMETONE mg/g	PROPAZINE mg/g	PROMETRYNE mg/g	SENCOR mg/g	SIMAZINE mg/g	DICAMBA mg/g	PICLORAM mg/g	SILVEX mg/g	2,4-DICHLORO-PHENOXYACETIC ACID mg/g	2,4-DICHLORO-PHENOXYBUTYRIC ACID mg/g	2, PH AC
				MEAN:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				MIN:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				MAX:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				STD. DEV.:		0	0.00	0.00	0	0	0	0	0	0	0	0	0	0	
				n:		1	1	1	1	1	1	1	1	1	1	1	1	1	

1984-1985 TRIBUTARY SURVEY
BOTTOM SEDIMENTS--CHLORINATED AROMATICS

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEXACHLORO-BENZENE ng/g	OCTACHLORO-STYRENE ng/g	PCBs ng/g
4	4	1	841125	36258	51	1	0	0
9		1	851117	16534	51	0		0
9		1	851117	16535	56	0		0
				MEAN:		0.33	0.00	0.00
				MIN:		0.00	0.00	0.00
				MAX:		1.00	0.00	0.00
				STD. DEV.:		0.47	0.00	0.00
				n:		3	1	3.00
4		2	841125	36259	51	7	1	0
9		2	851115	16530	51	0		25
9		2	851115	16531	56	0		30
				MEAN:		2.33	1.00	18.33
				MIN:		0.00	1.00	0.00
				MAX:		7.00	1.00	30.00
				STD. DEV.:		3.30	0.00	13.12
				n:		3	1	3.00
3		3	841115	36253	51	0	0	0
9		3	851118	16536	51	0		0
				MEAN:		0.00	0.00	0.00
				MIN:		0.00	0.00	0.00
				MAX:		0.00	0.00	0.00
				STD. DEV.:		0.00	0.00	0.00
				n:		2	1	2.00

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEXACHLORO-BENZENE ng/g	OCTACHLORO-STYRENE ng/g	PCBs ng/g
3	4	4	841116	36254	51	2	1	70
9		4	851118	16537	51	0		0
				MEAN:		1.00	1.00	35.00
				MIN:		0.00	1.00	0.00
				MAX:		2.00	1.00	70.00
				STD. DEV.:		1.00	0.00	35.00
				n:		2	1	2.00
9	8	6	851111	16526	51	0		0
				MEAN:		0.00		0.00
				MIN:		0.00		0.00
				MAX:		0.00		0.00
				STD. DEV.:		0.00		0.00
				n:		1	0	1.00
4	10	5	841125	36257	51	1	0	75
9		5	851119	16538	51	0		420
				MEAN:		0.50	0.00	247.50
				MIN:		0.00	0.00	75.00
				MAX:		1.00	0.00	420.00
				STD. DEV.:		0.50	0.00	172.50
				n:		2	1	2.00
3		6	841117	36255	51	1	0	1815
9		6	851119	16539	51	3		795

SURVEY NUMBER	BODY OF WATER	STATION NUMBER	DATE	SAMPLE NUMBER	SAMPLE TYPE	HEXACHLORO- BENZENE ng/g	OCTACHLORO- STYRENE ng/g	PCBs ng/g
				MEAN:		2.00	0.00	1305.00
				MIN:		1.00	0.00	795.00
				MAX:		3.00	0.00	1815.00
				STD. DEV.:		1.00	0.00	510.00
				n:		2	1	2.00
3	10	7	841119	36256	51	1	0	40
9		7	851120	16540	51	0		0
				MEAN:		0.50	0.00	20.00
				MIN:		0.00	0.00	0.00
				MAX:		1.00	0.00	40.00
				STD. DEV.:		0.50	0.00	20.00
				n:		2	1	2.00
9	15	3	851114	16529	51	55		65
				MEAN:		55.00		65.00
				MIN:		55.00		65.00
				MAX:		55.00		65.00
				STD. DEV.:		0.00		0.00
				n:		1	0	1.00
3		4	841105	36250	51	9	1	70
9		4	851113	16528	51	0		25

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                                                    HEXACHLORO-  OCTACHLORO-  PCBs
SURVEY  BODY OF  STATION   DATE    SAMPLE  SAMPLE  BENZENE      STYRENE
NUMBER  WATER    NUMBER            NUMBER  TYPE    ng/g         ng/g         ng/g

.........................................................................................................
                                   MEAN:                4.50         1.00        47.50
                                   MIN:                 0.00         1.00        25.00
                                   MAX:                 9.00         1.00        70.00
                                   STD. DEV.:           4.50         0.00        22.50
                                   n:                      2            1         2.00
.........................................................................................................
  3       15        5     841107   36252    51             0            0            0
  9                 5     851115   16532    51             0                         0
.........................................................................................................
                                   MEAN:                0.00         0.00         0.00
                                   MIN:                 0.00         0.00         0.00
                                   MAX:                 0.00         0.00         0.00
                                   STD. DEV.:           0.00         0.00         0.00
                                   n:                      2            1         2.00
.........................................................................................................
  3                 6     841107   36251    51           103            1            0
  9                 6     851113   16527    51             2                         0
.........................................................................................................
                                   MEAN:               52.50         1.00         0.00
                                   MIN:                 2.00         1.00         0.00
                                   MAX:               103.00         1.00         0.00
                                   STD. DEV.:          50.50         0.00         0.00
                                   n:                      2            1         2.00
```